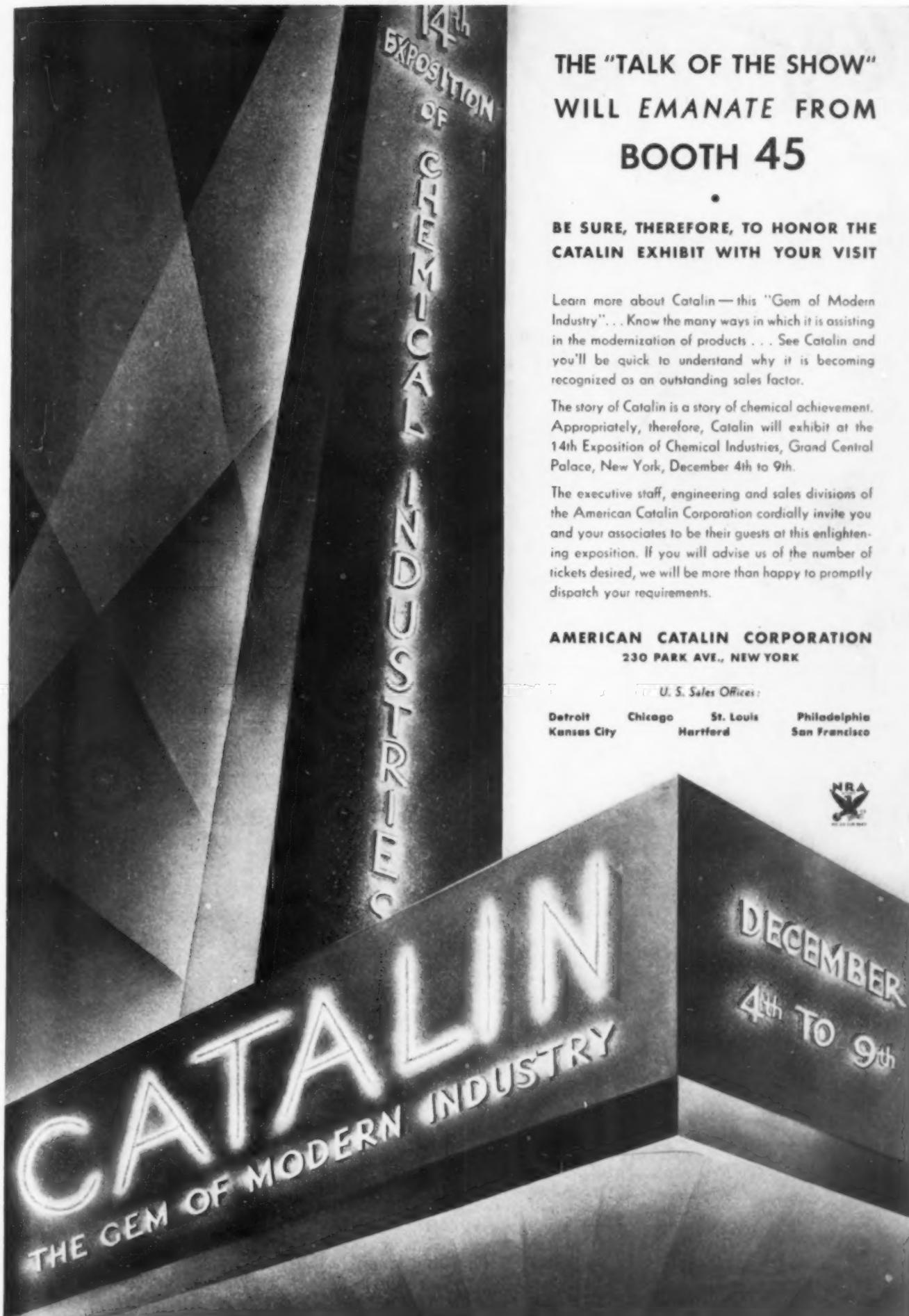


TP
986
A1
M69
V.9
W.9



THE "TALK OF THE SHOW"
WILL EMANATE FROM
BOOTH 45

BE SURE, THEREFORE, TO HONOR THE
CATALIN EXHIBIT WITH YOUR VISIT

Learn more about Catalin—this "Gem of Modern Industry"... Know the many ways in which it is assisting in the modernization of products... See Catalin and you'll be quick to understand why it is becoming recognized as an outstanding sales factor.

The story of Catalin is a story of chemical achievement. Appropriately, therefore, Catalin will exhibit at the 14th Exposition of Chemical Industries, Grand Central Palace, New York, December 4th to 9th.

The executive staff, engineering and sales divisions of the American Catalin Corporation cordially invite you and your associates to be their guests at this enlightening exposition. If you will advise us of the number of tickets desired, we will be more than happy to promptly dispatch your requirements.

AMERICAN CATALIN CORPORATION
230 PARK AVE., NEW YORK

U. S. Sales Offices:

Detroit	Chicago	St. Louis	Philadelphia
Kansas City	Hartford		San Francisco



DECEMBER
4th TO 9th

Plastic Products

Contents November 1933

Cover—Clock Cases Molded of Resinox
By Richardson Company

Cellulose Nitrate vs. Cellulose Acetate in Plastics
By E. C. Atwell 356

Driers for Plastic Finishes
By C. A. Klebsattel 360

A New Group of Plasticizers
By T. S. Carswell and Arnold Kirkpatrick 361

A Survey of Synthetic Camphor
By Ibert Mellon, M. Sc. 363

Properties of Benzyl Cellulose 367

New Thermoplastic Adhesives 369

Plastics in the News 371

Plastic Patents 379

*Indexed in the Industrial Arts Index
and the Engineering Index Service*

Volume IX

Number 9



PLASTIC PRODUCTS is published monthly by Plastics Publications, Inc. Williams Haynes, *Chairman of the Board*; R. C. Gilmore, Jr., *President*; Robert C. Gilmore, *Vice-President*; Malcolm H. Frost, *Secretary*; William F. George, *Treasurer*. Published on the first day of each month at Pittsfield, Mass., and printed for the publishers by the Sun Printing Company. Entered as second class matter at the Post Office at Pittsfield, Mass., under the act of March 3, 1879. Subscription rates: Domestic, two dollars, in advance; Canadian, three dollars, fifty cents, and Foreign, three dollars a year; single copies current issue, twenty-five cents each, back issues, fifty cents each. Notice of three weeks is necessary to change subscriber's address. Kindly give both the old and new addresses. Editorial and Advertising offices, 25 Spruce Street, New York, N.Y.
Contents copyrighted, 1933.

Plastic Products

VOLUME IX



NUMBER 9

Chiselling Cuts Two Ways

PLASTIC products are too low priced. This is universally true of the plastic materials from molding powder to synthetic resins. It is as true of the finished products from the cast bracelet to the laminated gear.

With these statements the plastic industries agree. All know too ---only too well--- how this disastrous price structure has been created during the past five years, and most have very good reasons for comprehending just what the effects are upon their own business.

But red ink on the balance sheet of the individual companies is not the only result of cheap plastics. The whole of the plastic industries have been thrown into a sort of spiritual bankruptcy and all plastic wares have been branded in the minds of consumers as "cheap goods". Sit down with any kind of plastics manufacturer and hear his views on the state of trade, and you will know how blunt his industrial conscience has become and how sharp his suspicion. Walk through the aisles of any "five-and-ten" and you will find pyroxylin toys, casein jewelry, a whole display of molded phenolics from tea cups to light sockets, cans of lacquer, and bolts of coated cloth. The whole gamut of the plastics is on display, and you cannot expect that makers of quality wares should be anxious to compete on

equal terms with such materials. While it is true that all the industrial materials of synthetic chemical origin are in competition on the price basis with natural raw materials, still it is the worst possible commercial strategy to sell them as substitutes. We have now definite knowledge of the properties of all our plastic materials that enable us to demonstrate their superiority over their natural competitors in many uses. It is more than a slogan when we say "nothing can take the place of lacquer". The synthetic resins have highly desirable characteristics no natural varnish gum possesses. The electrical properties of phenolic plastics are without rival. The movies, the radio, the motor-car are impossible without modern plastics.

And as a matter of plain dollars per pound our plastic materials are not cheap goods. They should not be sold as such. They should be marketed for just what they are---highly specialized, extremely uniform, elaborately perfected industrial raw materials capable of filling particular requirements as no other material can. This is the task of the makers of our plastic materials. They cannot escape the implication that a price structure rests on the base of its raw material costs so that fabricators and formulators are powerless to raise the level on shaky foundations.



Cellulose Nitrate vs. Cellulose Acetate in Plastics

By E. C. Atwell

Arthur D. Little, Inc., Cambridge, Mass.

THE term plastic is suggestive of something which can be worked or formed into various configurations by manipulation. Thus are included all organic substances which may be molded either hot or cold and with or without pressure. Although some metals and silicates may be molded they do not come under our immediate definition of plastics.

There are two types of organic plastic material; (1) thermoplastic, (2) thermosetting.

The thermoplastics soften on heating without change in composition or degree of polymerization. They become softer as the temperature is increased and only solidify and retain their forms on cooling. Therefore they may be repeatedly resoftened by heat. The thermosetting plastics also first soften under the application of heat but this softening is accompanied by a change in composition or degrees of polymerization which cause them to harden while still hot and prevents their subsequent resoftening. In this paper we will be primarily interested in the thermoplastic materials.

Different Types Materials

There are at present four distinct types of materials having, under the influence of heat and pressure, characteristics which qualify them to be classed as true plastic materials. The first of these—cellulose ester and ether plastics—include certain compounds of cellulose such as cellulose nitrate, cellulose acetate, and benzyl cellulose. These are all thermoplastic materials.

Resins constitute the second type. These include both natural resins and the resins produced by the chemical union of two dissimilar substances such as phenol-formaldehyde, urea-formaldehyde, and glycerine-phthalic anhydride resins and also those produced by the condensation or polymerization of single substances and include for example the cumar resins—produced by polymerization of coumarone and indene—or the vinyl resins produced by the polymerization of esters or halides of vinyl alcohol. This group includes both thermoplastic and thermosetting plastics.

Rubber derivatives constitute the third type and include besides the well known molded hard rubber a few recently developed rubber plastics. This group is composed largely of thermosetting plastics. The protein plastics constitute the fourth group of which the casein plastics are the most important commercially although the development of plastics from other proteins is being investigated.

This article discusses only cellulose nitrate (pyroxylin) and cellulose acetate thermoplastics, they being the most widely used members of the cellulose derivative plastics group. It seems very unlikely that early workers in the art of esterifying various forms of cellulose could have, to even a small degree, visualized the

importance of their developments and the tremendous proportions to which this industry would grow. Nor is it likely that they could have envisioned the manifold extensive uses to which these esters would later be used in other industries of equal size and importance.

The substance known as cellulose forms the basic structure of vegetable tissue. Treatment of the crushed plant tissues for the removal of all other materials yields pure cellulose. Cellulose, in a pure state, furnishes the raw material in the manufacture of the cellulose esters which today form the basis of our lacquer, dopes, cements, explosives, acetate and nitrate silk or rayon, and cellulose plastics industries.

The discovery of gun-cotton, chemically known as cellulose nitrate, is generally attributed to Shonbein in 1846. Of the other pioneers in the field of cellulose nitrate technology, among whom might be mentioned Braconnot, Pelouse, Dumas, Baron Von Lenk, and Abel, very few of them lived to see any great advances in their art. Most of their contributions related primarily to methods of reducing viscosity under heat and pressure and increasing the stability of gun-cotton and collodion cotton.

Many of the earliest patents relating to the successful use of cellulose nitrate or pyroxylin as a plastic were granted to Parkes in England in 1864. One of these covered a cellulose nitrate plastic containing camphor. The earliest U. S. patents on this subject were issued to Cutting in 1861, Ray in 1865 and Pierson in 1867. Of these, Pierson, having a more extensive knowledge of the viscosity characteristics and degree of nitration of the cellulose nitrate used and avoiding the use of castor oil, developed a plastic for general manufacturing purposes.

During the next few years much of the endeavor of experimenters was directed toward making dental plates without the use of rubber and all were apparently seeking to decrease the amount of solvent used, predominantly by the use of castor oil. This was the pitfall into which all had fallen.

First Plastic Invention

The first development of a satisfactory plastic can not justifiably be accredited to any one individual. Each worker at some time by his efforts made some contribution to the general problem which in turn was taken advantage of by his contemporaries. In 1863 John W. Hyatt, a printer by trade, stepped into the picture, being led to do so by a substantial reward offered by a prominent New York billiard ball firm for a process of making a satisfactory substitute for ivory billiard balls.

In 1869 John Hyatt was granted a U. S. patent on the use of pressure and heat in evaporating solvents from collodion coated paper pulp balls and later for ivory dust held together by collodion and subjected to great pressure and heat, the latter for the

specific purpose of volatilizing the collodion solvent (alcohol-ether mixture). Thus far Hyatt had contributed at least two of the fundamental operations in the production of cellulose plastics. He was apparently unaware of Parkes' work with camphor and his failure to avail himself of it was responsible for the unsatisfactory nature of his earlier materials.

In 1869 he was joined by his brother Isaiah. In the course of their further experiments they independently discovered that camphor would plasticize cellulose nitrate. In 1869 U. S. patents 91,341 and 105,338 in 1870 were issued to them jointly. These two patents describe the method of making Celluloid and the general conditions of plastic manufacture upon which even present day processes are based. On November 19, 1872, the Hyatt Brothers were granted U. S. patent No. 133,229 which disclosed the definite steps in every phase of the manufacture of Celluloid by the use of cellulose nitrate and a latent solvent (camphor) under great pressure and heat.

From this time on advances in the art and in the growth of the industry were phenomenal. Many contributions, perhaps it is even safe to say most of the contributions to the art, in the U. S. were those of technicians in the employ of the larger manufacturers of pyroxylin (Celluloid Corp., du Pont Viscoloid Co., Fiberloid Corp., and Nixon Nitration Works). Foremost of these contributions was probably the stabilization of plastics grade cellulose nitrate by the removal of minute traces of residual acids and sulfuric esters.

Pyroxylin or cellulose nitrate plastics are characterized by their extreme toughness at ordinary temperature and workable plasticity under moderate heat. Upon these properties has been built a pyroxylin plastics industry capable of producing even in these times of reduced industrial production a total of over a million pounds of stock in the form of sheets, rods and tubes in one month (July 1933). Production of cellulose nitrate plastics throughout the world is said to run into 30,000 to 40,000 tons annually. Plastics of this type are also made in the form of films.

Proper Use of Term "Celluloid"

The term "Celluloid" is popularly but erroneously associated with all plastic products of this type, whereas the trade recognizes the name "Celluloid" as the copyrighted name of pyroxylin products manufactured by The Celluloid Corporation. The name "Celluloid" was first applied by the Hyatt Bros. to their plastics produced from cellulose nitrate and camphor. All other pyroxylin plastic manufacturers have copyrighted names for similar products and feature these names in their advertising. Representative names of these products are "Viscoloid", "Fiberloid", "Pyralin", etc.

About 95 per cent. of all pyroxylin plastics manufactured are made with camphor. The substitution of other materials for camphor has met with variable success. For certain specific applications they have been satisfactory.

In the manufacture of pyroxylin plastics, alcohol dehydrated cellulose nitrate of 10.7-11.2 per cent. nitrogen content is kneaded together with camphor and alcohol at moderate temperature, whereas in the manufacture of photographic films, nitrocellulose of 11.2 to 11.7 per cent. nitrogen content is employed. Other materials are frequently added according to the purpose for which the product is to be used. These materials may be stabilizing, softening, coloring, or filling agents. Organic amino compounds are generally used as stabilizing agents, such as urea, or diphenylamine. Vegetable oils, both raw or blown, dibutyl phthalate, tricresyl and triphenyl phosphate, triacetin, glycerine esters, and esters of lactic acid are frequently used as softening and plasticizing agents with or without the presence of camphor. In addition, many other materials are used commercially for softening and plasticizing. Among the commonest filling materials magnesium oxide, zinc oxide, titanium oxide coated base pigments colored pigments, borax, gelatin and gums may be mentioned.

Commercial pyroxylin plastics are composed roughly of 70-80 per cent. of dry, fibrous plastic grade cellulose nitrate, 20-30 per

cent. camphor, and in opaque stocks up to 40 per cent. of added materials as noted above.

The inherent useful properties of pyroxylin plastics in addition to that of plasticity with heat and pressure are its transparency, elasticity, hardness, density and toughness. Pyroxylin plastics in general are adaptable to a wide range of fabricating methods, being easily machined, cut, veneered or molded.

Although normally of a clear, gelatin-like appearance, pyroxylin plastics may be enhanced in beauty by the addition of aniline dyes or metallic pigment. Then by ingenious methods of mixing variously colored sheets and cutting strips at different angles, or subjection to a mild kneading process, many colorful striped and mottled effects may be produced.

Cellulose Nitrate Plastics Highly Inflammable

In certain instances these useful properties are counterbalanced by the inflammability of the product which is responsible to a certain extent for a somewhat restricted distribution in the general field of plastics. The cellulose nitrate plastics are normally of a highly inflammable nature, ignite easily and burn with a smoky flame. The inflammability may be reduced by the incorporation of proper modifying agents. Being unlike the highly explosive materials nitrogen iodide, nitroglycerine, fulminate of mercury, etc., they are not subject to detonation on impact nor are they liable to ignite spontaneously. Sufficient oxygen is held in chemical combination with the cellulose nitrate component of the plastic mass for nearly complete oxidation which permits of its rapid combustion when ignited in the absence of air.

Exposure to temperatures above 300°F. for short periods of time such as might develop by heat radiations from high pressure steam pipes or from electric lamps may start flameless combustion. Noxious gases—principally the oxides of nitrogen, carbon monoxide and dioxide, and hydrocyanic acid gas**—are formed during flameless combustion and such a gaseous mixture presents a very real hazard by reason of its highly poisonous and explosive nature. One kilogram of clear pyroxylin plastic is reported to generate 2500-4500 calories of heat and the combustion temperature may possibly reach 1500-1700°C.

In spite of what might appear to the uninitiated as an unfavorable picture of the inflammable nature of these pyroxylin plastics, it should be said in all fairness that there is no unusual hazard in handling them. The same precautions should be observed in handling pyroxylin plastics as for such other inflammable materials as gasoline or the common lacquer solvents. In the hope of reducing unnecessary loss of property and personal injury to persons handling pyroxylin plastics, the International Labor Office (League of Nations) has recently released a publication on "Safety in the Manufacture and Use of Celluloid".*

To make pyroxylin plastics more opaque or less inflammable, oxides or chlorides of zinc, aluminum or magnesium may be added. Many articles in general are made entirely of pyroxylin plastics. Other materials may be worked into pyroxylin plastics for the purpose of changing its appearance, feel, or other properties. It can be made to imitate different natural substances such as horn, ivory, pearl, tortoise shell, marble, wood, ebony, amber, leather, skins of animals and reptiles, etc. Finishes simulating the skins of animals, reptiles, weaves of fabrics, geometrical and modernistic patterns are available in sheet form.

Wide Range of Patents

The number of different applications of pyroxylin plastics in general is reported to reach 25,000. Prior to 1932 its most widely used industrial application was as a film in photography and next as the middle layer in safety glass. Since 1932, this order has very suddenly reversed. Numerous other products include tooth brushes, combs and toilet sets, toilet seats, spectacle frames, fountain pens, drawing instruments, toys and novelties. Its use in umbrella handles, sticks, buttons, fastenings in clothes and shoes has declined.

The first successful attempt to acetylate cellulose is attributed

to Schuetzenberger during the period 1865-69 and although the purpose of the project was achieved technically, it was not until 1894, 48 years after the first successful nitration of cellulose, that Cross and Bevan took out a patent on a process for the acetylation of cellulose to form cellulose acetate. At first it appeared that the new material had some of the properties of collodion cotton and gave promise of replacing inflammable cellulose nitrate in the manufacture of certain films and threads. In practice, however, it was found that this particular cellulose acetate had many disadvantages. It lacked toughness and stability, became brittle and horny, and could be dissolved only by two solvents; the principal one, chloroform, being unpleasant to work with; the other, epichlorhydrin, high boiling.

In 1904, a ripening process developed by Miles, produced a secondary cellulose acetate characterized by its similarity of exterior aspects but differentiated by its solubility in cheap solvents and its ability to be plasticized with camphor substitutes to produce films, plastic masses, or threads. The first commercial production of acetate fiber is credited to the Lustron Company operating under the patents of Little, Walker, and Mork where a capacity of 500 pounds a day was attained about 1920.

Inherent Characteristics of Cellulose Acetate

Cellulose acetate was first brought to general attention during the World War by its use as a lacquer or varnish for the fabric on airplane wings, and was chiefly selected because of its properties of low hygroscopicity and slow rate of burning. Certain of its inherent characteristics are important in connection with its use in fiber extrusion; others with its use for lacquer. In connection with its use in plastics the more important properties are those of clarity, stability to heat and light and the slow rate of burning which is characteristic of present day cellulose acetate plastics.

The extension of its use as a plastic material depends upon the future development of cheaper cellulose acetate, compatible plasticizers and cheaper solvents. This has occupied the minds of capable chemists in this field for some twenty-five years. Some progress has been made during the period and particularly during the past two years but there still remains much to be done. At present there is no single plasticizer for cellulose acetate comparable to camphor in cellulose nitrate although certain mixtures of the few known plasticizers approach it in certain respects.

The use of cellulose acetate in the manufacture of acetate silks or rayons exceeds all outlets for it today. Its use as a plastic in safety glass and other uses ranks second and in film, third.

Laminated Safety Glass

Laminated glass is the product of bonding two dissimilar materials—glass and an interlayer of a thermoplastic sheet—and involves the use of adhesives, heat and pressure. The safety feature of laminated glass depends upon the strength and adhesion of the plastic filler sandwiched between the two plates of glass. The plastic layer provides the factor of high tensile strength combined with high elongation and, when provided with adequate adhesiveness to the glass, greatly reduces the tendency of shattered glass to fly or scatter. To meet the rigid requirements of the art, the plastic sheet or filler must be clear, capable of being rendered plastic by heat and pressure or by pressure alone, unabsorbent, unaffected by exposure to light and permanently plastic over a wide range of temperature.

The use of pyroxylin plastics was practically exclusive as the bond in laminated glass for all purposes during the period from 1914 to shortly after 1927. The state of the art up to this time was far from satisfactory and coupled with the added cost prevented general acceptance of the product in other than in special uses, and these consumed comparatively small quantities. The inclusion of over-nitrated and under-nitrated cellulose particles within the plastic sheet produced a perceptible haze. Exposure to sunlight for long periods or temperatures in the vicinity of 100°F. produced a brown discoloration and embrittling. Progress

in the technology of cellulose nitration has furnished the industry with a better, more stable, more uniform product, so that today laminated glass with celluloid fillers is less hazy, and capable of withstanding sunlight for longer periods and higher service temperatures without detriment. The cellulose plastics and laminated glass manufacturers have cooperated for the past 8 or 9 years in an united effort to make still further improvements toward greater stability to heat and light.

Sales Progress Cellulose Acetate Plastics

Since 1932 the progress in the development and sale of cellulose acetate plastics for motor car safety glass manufacture, notwithstanding that the price was higher, has been greater than the progress made in cellulose nitrate plastics from 1927 to 1932 inclusive. It is now reported that the largest manufacturer of safety glass in the United States uses cellulose acetate plastics exclusively for the manufacture of wind shields, and the second largest manufacturer has discontinued the use of pyroxylin plastics and now uses only cellulose acetate plastics. The reason for this is attributed to the greater stability of color and better clarity of the cellulose acetate product which has long been recognized, but which could not be utilized to full advantage until the recent development of methods for obtaining the adhesion and strength required in this exacting art. Cellulose nitrate differs from cellulose acetate in that an initial decomposition started by heat or light becomes progressive and proceeds autocatalytically even when withdrawn from the source of heat or light. A special glass may be placed over a cellulose nitrate plastic sheet which will absorb and thus protect the sheet from decomposition by ultra-violet light, but this in no way protects the sheet from the heat of the sun. Cellulose acetate will withstand considerable heat and light for long periods of time without deterioration.

The slow burning properties of cellulose acetate led to its adoption in 16 mm. safety movie film for home use. Its use in still camera cut film has reduced bulk, weight, breakage and halation difficulties experienced with glass plates. The Eastman Kodak Company as a contribution to the campaign for safety in hospitals has recently announced elimination of the premium in the price of x-ray acetate safety film, making it available at the cost of ordinary nitrate stock film. Higher cost and inferior strength of the wider film has retarded any extensive use in commercial moving picture film. The more inflammable pyroxylin film now presents no particular hazard. With proper facilities and the precautions now mandatory it has been used with safety for many years.

The low susceptibility of cellulose acetate to moisture absorption gives it a high dielectric strength, and has led to its use in the electrical industry as a dip lacquer covering for bare wire and also as the thread for woven fabric covering the rubber insulation.

Transparent Wrappings

Recently cellulose acetate transparent wrapping materials have been introduced as a direct competitor to the viscose types which are commonly known as Cellophane and Sylphwrap. They appear under various trade names as Kodapak, Inceloid and Protectoid. These thin sheets of transparent cellulose acetate are soft and brilliantly transparent.

Cellulose acetate in powdered form is well adapted for molding, being permanently thermoplastic and resistant to high heat and pressure. Its use in this field ranks fourth in importance. The molded products are tough, and water, light and heat resistant. Small quantities of added pigment enhance the beauty, and produce depth of color.

Cellulose acetate molding powders are used in extrusion processes and are particularly adaptable for extrusion in shapes having thin walls. A press recently designed for injection molding uses cellulose acetate molding powders successfully. This type of press is said to be suitable for only truly thermoplastic materials,

although thermosetting plastics can be injection molded by a different set-up.

The film formed by combining cellulose acetate sheets with wire cloth and known as Celloglass and Vimlight is used, quite extensively, in poultry-houses, green-houses, and hospitals because of its transparency to ultra-violet light.

Much can be said about the relative value of this or that material for plastic or molding purposes but beyond all this there is a continuous effort among progressive manufacturers to make better stock at lower costs and by fabricators to create new uses, and new products from cellulose derivatives: utilitarian values are being coupled with artistic shapes and designs in the hope of successfully keeping abreast of competition from synthetic resin plastics. The opportunity for developing new and artistic effects being recognized, the future success of either industry may well be based on the results to be achieved in this direction.

*Copies at one dollar each may be obtained from the World Peace Foundation, 40 Mt. Vernon St., Boston, Mass.

**Chem. & Met. Eng. 36, No. 6, 334, June 1929.

**Chem. & Met. Eng. 36, No. 6, 493, Aug. 1929.

Equipment for the Plastics Industry

THE two base requirements of all processes within the plastics industry are heat and pressure, excluding the tool-room where the essentials are precision and inherent skill. Tracing the operations from base resins to finished molding, the chief steps are: (1) the resins are mixed with fillers and pigments; (2) then bonded on steam heated rollers; (3) the thin bonded sheets broken into small pieces; (4) the small pieces disintegrated to powder; (5) the powder graded for size or made into pellets; (6) put in the mold and heat and pressure exerted to form the molding; and (7) the surplus flash removed. In only one operation does heat and pressure become inter-linked and that is in the boiler. This important plant unit is used for generating heat for transmission to the various machines, and the questions of abnormally high pressure and super heats do not necessitate attention. Requirements are generally filled by a multi-tubular vertical boiler of the Cochran type working at a maximum gauge pressure of 200 lbs. per sq. in.

Dry Mixing Operations

Irrespective of whether phenolic, cresylic, urea resins, or cellulose acetate powders are to be made the first process is the thorough mixing of the ingredients and colors. The machine generally used for this dry-mixing process consists of two spiral-shaped arms rotating in opposite directions in a drum shaped body into which the mix is placed. Where the mix shows a tendency to become more viscous a more rugged type of machine is employed, with a single shaft rotating in the mass. Leaving these machines, which are of the type developed for solution mixing in the rubber industry, and dough mixing in the bakery trade, the mix is now ready for batch mixing.

Three separate types of machine are used for this operation. The first, the *Bridge Banbury*, is the British edition of the Banbury used in the United States for working rubber to mix. The merits claimed for it are greater uniformity of the finished product, a saving in labor, elimination of the personal element, and saving of floor space. The second, are the "Universals," which have progressed some way from their dough mixing designs, for they are required to withstand heavy strains. The rotating arms intermingle the powder constituents, in the same operation drives them against the body of the machine, so assisting in thorough blending. When necessary to draw off moisture or collect solvents, pyramid shaped lids and vacuum type stuffing boxes ensure the maintenance of high vacuum. The third type are *mixing rolls*, in which the weight of the batch depends on the area of surface of roller and thickness of

"take off" of the sheet. The rolls are cored to allow for steam heating and water cooling, and are made of cast iron or steel. The largest rollers required can be guaranteed to a tolerance of 1/1,000 in. Makers of repute match their rollers for hardness, for a hard roller working against a soft one causes discoloration, the bugbear of the industry, which is due to fine iron dust. The general lines of the mills are those evolved for the rubber industry, which has used them continually for mixing and grinding since 1821. Bearings have been introduced to combat effectively the effects of abrasion by powder dust. A fourth type, the *ball mill*, is also used, with chain drive replacing the common belt drive.

Phenolic and cellulose mixes leave the rollers in the form of thin sheet, and where they are batch milled by any other method are put through the roll mills as the final process prior to being reduced to granular powder, the state in which they are supplied to the molder. The sheet is broken up into one-half to one-fourth inch squares by passing through toothed rollers, these pieces being further reduced in a disintegrator. Various forms of disintegrator are used, but their action is more or less the same, the small pieces being allowed to fall into the path of beaters or blades revolving at anything from 1,500 to 3,500 r.p.m. The beaters are numerous and the impact sufficient to powder the pieces and fling the powder against a screen until small enough to pass through a perforated screen which determines the maximum size. It is then sub-divided into various stages of fineness, either with a flat oscillating sieve or one of the vertical centrifugal type. The powder then goes to the molding shop, either in granular or tablet form for simplicity in loading the mold.

Molds

Molding equipment is the most interesting. The molds are the fulcrum of the whole industry. For long runs of an article they are made of the finest obtainable steel, but for short runs can be of tough brass, particularly where ornamentation is involved, since hand engraving can be used. Single or multi-impressions, dependent on the class and number of articles to be produced, are cut from the solid, or, after hardening and tempering, used as a punch to press into a soft steel block to shape the external forms—the process known as hobbing.

Molds can be fixed or loose. Large molds rapidly becoming common to industrial concerns made a fixed type the only practical one. Where urea powders are to be used the molds should be chromium plated or of special stainless alloy. For cellulose acetate molding the essential feature must be that of rapid heating and cooling of the molds.

Pumping Systems

The standard working pressures of pumps range from 2,000 to 2,240 lb. per sq. in. and few troubles are encountered. Today there are numerous good solid pump designs to work from, any of which can be trusted to give good and efficient service. The various systems employed are: (1) the constant speed pump feeding accelerator; (2) air-loaded accumulators; (3) variable pressure pumps directly feeding presses; and (4) variable speed pump through fluid coupling.

In the first type the pump feeds what is probably the most important adjunct in hydraulic transmission, the accumulator, since this constitutes an artificial head in which water pressure is carried by other material than water. In the familiar weight and case types the ram is fitted with a T-head to which weights are hung. These exert pressure on water within the accumulator cylinder, and as they are raised there is a store of potential energy to be drawn upon through the main pressure line system. With the second type, air-loaded accumulators, it is possible to vary the main line pressure quickly, always an advantage. This arrangement calls for much less floor space. From a lecture given by W. Owen Griffiths at the Plastics Industry Exhibition.—*Abstracted from The Chemical Age.*

Driers for Plastic Finishes

By C. A. Klebsattel
Advance Solvents & Chemical Corp.

"PLASTICS" is often understood to include certain classes of materials used in the form of solutions as varnishes or lacquers. The solids in such solutions have characteristics which justify so classifying them.

Many materials are so used and a list, by no means comprehensive, includes cellulose esters and ethers, condensed or polymerized hydrocarbons, polymerized unsaturated esters, and all manner of synthetic resins used alone or in combination with drying oils. This latter group includes some of the most important commercially used protective coatings in use today. The consumption of synthetic resin-oil varnishes and of alkyd resins modified with drying oils and fatty acids amounts to millions of pounds annually and is increasing steadily.

By far the larger amount of all such varnishes and resin solutions used as industrial finishes have incorporated in them driers to accelerate the oxidation and hardening of their films. Driers, meaning oil-soluble organic soaps of lead, cobalt, and manganese, are considered to be catalysts for the oxidation of drying oils. Their use in various forms is wide, and their influence on film properties is so important that a brief discussion of driers in general may be of interest to the readers of PLASTIC PRODUCTS.

From earliest times varnishes and paints have been made to "dry," or more properly solidify, by including in them oil soluble compounds of lead and manganese. More recently cobalt has been used in the same manner. Today these metals are still the standard although others find special applications.

Primitive practice was to form these oil soluble compounds by heating with the oil or varnish appropriate oxides or salts of the metals. By various reactions organic compounds of the metals were formed, which compounds were more or less soluble in oils. Fairly recently concentrated soluble driers have been formed by preparing the straight soaps of the free acids of resins and oils. Examples are resinates (from rosin), Linoleates, (from linseed oil), Tungstates (from Chinawood oil) and mixtures thereof.

Modern practice is no whit different in this respect. Many manufacturers still incorporate driers by cooking in litharge, manganese dioxide, cobalt acetate, and other metallic salts. On the face of things, this is the cheapest manner of attaining the desired result, but increasing numbers are finding this doubtful. Such procedure involves prolonged heating with high fuel and labor expenditures. Almost always there is incomplete assimilation of the metals, some uncombined metal being thrown away as sludge. And finally, in too many cases, after initial apparent solution, voluminous and heavy precipitates form causing further losses and changing the drying characteristics. All this means losses and uncertainty. These remarks apply in general to both varnishes containing cooked-in drier and to ordinary liquid driers as prepared to add to other finishes.

Ordinary linoleate and resinate driers have been used for many years with a reasonable degree of satisfaction. One good reason

for their widespread use was the fact that no better type drier was available. However, these concentrated driers have many of the defects mentioned before, since they and the driers in the other forms have common sources. Many of the drawbacks of common driers are traceable to their organic acid bases. Resin acids and drying oil acids are for the most part unsaturated bodies capable of oxidation themselves. In storage their soaps may oxidize either in solid form or in solution, and as they do so, many changes in properties may occur. A few of these changes frequently, but not necessarily, observed are as follows:

Solubility may be decreased, not only in volatile solvents, but also in oils and varnishes and other media. Precipitation or skin formation takes place due either to actual decreased solubility of the metal soaps or to formation of other less soluble complex compounds. Activity per unit quantity of metal as an aid to drying may be altered, becoming either greater or less depending upon whether the drier soaps originally incorporated tend to further disperse or to coalesce. Staining power and after yellowing are often affected adversely, since oxidation of these compounds usually is accompanied by the formation of color bodies. These effects, however, are of minor importance.

All the foregoing would lead to the conclusion that, so far as soluble driers are concerned, the old types described leave much to be desired, and to indicate that there is room for considerable improvement in this field. Granting this, and in keeping with technical progress in other fields, improvements have been made in driers. Among these in the development stage are soaps of synthetic fatty acids derived from the oxidation of paraffin or petroleum oils and soaps of acids synthesized from coal tar derivatives.

As a type drier improved over older driers the pioneer in the field and one with now a background of several years manufacturing experience and commercial use is that sold under the trademark "Soligen" driers. These have as their basis a very carefully selected and refined fraction of naphthenic acids derived from a certain petroleum, thus assuring a uniform and dependable raw material. These particular naphthenic acids belong to the cyclo-paraffins and are so chosen as to vary in molecular weight only within narrow limits. They are practically entirely saturated and hence incapable of significant oxidation by the air.

This combination of properties, together with the phenomenally high solubility of the heavy metal soaps of these acids in solvents and resinous varnishes, provides a series of exceptionally interesting concentrated driers. Their most interesting features may be listed as follows:

Metal contents are high, due to the low molecular weight of the specially selected acids used. Typical examples are: "Soligen" lead—contains 33% combined lead; "Soligen" manganese—contains 11% combined manganese; "Soligen" cobalt—contains 12% combined cobalt, and variations are so small as to be neglected for all practical purposes. Solubility is, as mentioned before, practically perfect, hot or cold in volatile solvents, and compatibility with varnishes and resinous vehicles vastly better in the great majority of cases than with the older type driers. Precipitation and skinning in mineral spirits solution are absent, and with nearly all varnishes and resin solutions no precipitation ever takes place. Oxidation of the driers cannot take place to alter these relationships.

Activity as drying catalysts:—a given amount of metal in "Soligens" does not differ greatly in activity as compared to the best forms of the older driers. However, what is outstanding is the uniformity of this activity. It makes no difference whether these "Soligens" are incorporated hot or cold-cut, freshly made or after several years of storage. The drying power is the same in all cases and is not altered by oxidation of the organic base. The high metal content, moreover, the ease with which they can be dissolved, the elimination of losses due to incomplete solution and precipitation, and their complete uniformity and dependability, together with reasonable prices, are creating a constantly growing field of usefulness.

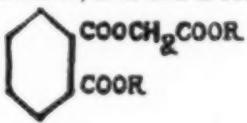
The Esters of Phthalic and Glycollic Acids

A New Group of Plasticizers

Increased use of cellulose ester coatings has shown the need for better plasticizers. Chemists have worked out improvements on the older ones, but new requirements include such factors as absence of toxicity. Carswell and Kirkpatrick point out the interesting properties of a new series, derivatives of phthalyl glycolate.

By T. S. Carswell and Arnold Kirkpatrick
Research Laboratories, Monsanto Chemical Co.

A NEW series of plasticizers recently developed embody to a remarkable degree features especially desired in plasticizers for cellulose esters and their various compositions. These are the mixed esters of phthalic and glycollic acids, specifically the methyl phthalyl ethyl glycolate, ethyl phthalyl ethyl glycolate, and butyl phthalyl butyl glycolate, sold under the trade names, respectively, of Santicizers M-17, E-15 and B-16. They have the general type formula



where "R" denotes the appropriate alkyl group.

These new plasticizers have the following physical properties:

TABLE I

	M-17	E-15	B-16
Boiling Point (under vacuum)	189° C. @ 5mm.	190° C. @ 5mm.	219° C. @ 5mm.
Crystallizing Point (1)	Below - 10° C.	20° C.	Below - 10° C.
Evaporation Rate (2)	.00272	.00213	No loss
Density	1.2184 @ 25° C.	1.1774 @ 25° C.	1.0956 @ 25° C.
Pounds per gallon	10.16	9.82	9.14
Refractive Index	1.5049 @ 25° C.	1.4987 @ 25° C.	1.4897 @ 25° C.
Toxicity	Non-toxic	Non-toxic	Non-toxic
Color (3)	Trace	Trace	Trace
Odor	None	Trace	None
Taste	Bitter	Bitter	None
Solubility in Water (4)	900 ppm.	175 ppm.	12 ppm.
Hydrolysis by Water (5)	None	None	None
Decomposition by			
Alkali (6)	21.28%	11.19%	None
Viscosity (in centipoises) (7)			
@ 0° C.	1671	611	295
@ 10° C.	455	215	136
@ 25° C.	100	63	51
Light stability	Excellent	Excellent	Excellent
Retentivity in N/C	100%+	100%+	100%+
Retentivity in AC/C	100%+	100%+	20-30%

- (1) Unless seeded, E-15 must be cooled to about - 6° C. before crystallization begins.
- (2) Grams lost per square centimeter of surface in 72 hours at 100° C. For comparison, dimethyl phthalate is .0595 and dibutyl phthalate is .00572.
- (3) Commercial production. Pure products are colorless.
- (4) Value in parts per million at 30° C.
- (5) Boiling water for one hour.
- (6) Per cent. decomposed on stirring with 10% NaOH solution at 80° C. for 20 minutes.
- (7) For comparison, the value for tricresyl phosphate is 67 centipoises at 23.7° C.

These compounds are all solvent-plasticizers, Santicizer B-16 being especially designed for use with cellulose nitrate and the other two for cellulose acetate. They can be used interchangeably, however, although the retentivity of B-16 in cellulose acetate is rather low for some purposes and under certain conditions may cause a tendency to separation and a resulting whitening of the product. Santicizers M-17 and E-15 are both solvents for cellulose acetate and may be used in any proportion necessary to give the desired properties. All three are solvents for nitrocellulose.

An especially valuable characteristic of this new trio is the complete absence of any toxic effect. Extensive tests made on rabbits, guinea pigs, rats, cats and chickens show that even large doses administered over an extended period of time cause no ill effects. These products are entirely safe, from a health standpoint, to use in any composition where toxicity must be avoided, such as molded toys for children, lacquers for food receptacles, and foil for wrapping food products.

Their plasticizing effect is not only great, but it is permanent, due to the low evaporation rates. The evaporation rate of Santicizer M-17, which has the highest rate of the three, is about half that of dibutyl phthalate and only about one-twentieth that of dimethyl phthalate. Cellulose ester films, less than one-thousandth of an inch in thickness, plasticized with these materials and hung in a well-ventilated room, have shown little, if any, decrease in plasticity after many months.

Physical Properties of Santicizer M-17

Santicizer M-17, having the highest solvent power, produces the greatest softness in cellulose compositions for a given percentage by weight, but the difference between it and E-15 is not great. Films containing less than 20% of plasticizer (that is, 20 parts by weight to 100 parts of cellulose ester) are noticeably softened; those containing 75% are, if the films be thin, quite limp; and if 100% be incorporated, there may be a trace of tackiness, especially in the case of nitrocellulose. The plasticizers will not separate or sweat out, however, except in the case of B-16 and cellulose acetate already mentioned.

Light stability, determined by exposing films containing usually 50% of plasticizer to light, either from a carbon arc, a

mercury vapor lamp, or direct sunlight, is excellent, being of about the same order as dibutyl phthalate. This feature is essential for use in colorless or delicately tinted compositions. They are not stabilizers, however, and do not prevent the normal yellowing of nitrocellulose.

Compatibility Features

Compatibility with resins is an important property of plasticizers that are to be used in combinations containing resins, and all three of these products have this property to a high degree. They are solvents or latent solvents for many resins and impart considerable plasticity to them, whether used in the resins alone or in combination with cellulose esters. One notable exception is the urea-formaldehyde type of resins with which they are not compatible. Their high boiling points make it possible to blend them with resins at comparatively high temperatures and even to introduce them at various stages of resin formation. Santicizer B-16 lends itself particularly well to this procedure, especially with the glyptal and phenol-aldehyde types.

A comparison of tensile strength, elongation and moisture penetration measurements of nitrocellulose and cellulose acetate films plasticized with various percentages of these compounds gives some idea of the effect produced by such additions.

TABLE II
Cellulose Acetate

	Tensile Strength Kg/Cm ²	Elongation Per cent.	Moisture Permeability Control = 100%
Control	528	2.3	100
25% Santicizer E-15	472	5.7	89.5
" " M-17	468	10	80
" " B-16	420	6	84.7
50% " E-15	256	14.7	79.3
" " M-17	266	24.7	84
" " B-16	315	12.3	84.9
75% " E-15	136	28	86.4
" " M-17	144	35.3	92.5
" " B-16	243	13.3	85
 Cellulose Nitrate			
Control	528	5	100
25% Santicizer E-15	502	11.3	52.5
" " M-17	463	11	48.8
" " B-16	501	15.3	60
50% " E-15	287	7	42.3
" " M-17	289	9.3	42.4
" " B-16	260	18	52.7
75% " E-15	56	42.7	63.2
" " M-17	Too soft for accurate sample		73
" " B-16	64	24.7	73.1

The cellulose acetate films were made from low viscosity acetate dissolved in acetone, and the nitrocellulose films from solutions of R.S. one-half second cotton in a solvent composed of equal parts of toluene and butyl acetate. The films were made on plate glass panels on a spinning-table, stripped as soon as sufficiently set, and aged for one week in a well-ventilated room before testing. Film thickness was measured with a micrometer just before testing. Tensile strength and elongation measurements were made on a Gardner-Parks Film Tester. Moisture permeability measurements were made by sealing films over the mouths of jars containing anhydrous calcium chloride, exposing in a humidity cabinet for 24 hours or longer and measuring the increase in weight of the calcium chloride due to moisture penetration through the films.

The values are only comparative in a general way since the viscosity and age of the cellulose esters, the kind of solvents used, and the conditions of temperature and humidity at the times of making and testing the films all have an appreciable effect on the values obtained.

Resistance to Mild Alkalies

Santicizers E-15 and M-17 are quite resistant to mild alkalies and Santicizer B-16 is very much so, as is apparent from Table I. Its almost complete lack of solubility in water, coupled with its inherent stability, renders it unaffected by the alkalies ordinarily used for cleaning purposes. This is important for lacquer coatings that are subjected to frequent washing.

All three compounds are readily miscible with most common organic solvents, but with petroleum hydrocarbons, chinawood oil, linseed oil and turpentine there is a sharp divergence in action. B-16 is readily miscible with all of them, but M-17 and E-15 are practically insoluble in petroleum hydrocarbons. E-15 will mix with turpentine on warming and will then remain in solution, whereas M-17 will mix when warm but separate on cooling. With chinawood oil and linseed oil both E-15 and M-17 will mix when warm but separate on cooling, M-17 separating more readily than E-15.

When heated with chinawood oil, these three products delay gel formation, and if the time and temperature are carefully controlled, a heavy, viscous product results. B-16 has the most pronounced action in this respect, requiring less attention to time and temperature, permitting the polymerization to proceed further, and still giving a product that is without gel lumps and completely soluble in benzene, toluene, naphtha, or a mixture of these with butyl acetate. The polymerized oil can be used in nitrocellulose lacquers and in varnishes, but is not compatible with cellulose acetate.

*These products are covered by patent applications of L. P. Kyrides, assigned to the Monsanto Chemical Company.



New Desk Telephone

Brought out to meet the need for a handphone that could be handled more easily, that would "talk" more efficiently, and at the same time completely satisfy the demand for modernity so prevalent today, the Masterphone desk set is unusually well suited for use in office and industrial work, because of its simplicity, handling efficiency, and excellent tone quality. Only one hand is required to use it.

True to its name, it possesses transmission and reception qualities equal to the high efficiency of the Kellogg desk stand. In appearance, it surpasses all other types of telephones. In gaining these much desired qualities, however, neither operating efficiency or durability have been sacrificed.

One of the most interesting features of the instrument, is the fact that it is a completely molded product. The entire base is Bakelite, molded in one piece. Considering its unusual design and streamline shape, this instrument is quite an accomplishment in the molded products field. The handset, too, is molded in one piece, except for the rings which hold the removable mouthpiece and transmitter in place. Two solid brass bars are molded in the handle to strengthen it as well as to form a concealed connection between the transmitter and receiver.

Kellogg Switchboard and Supply Company engineers have succeeded in designing a telephone that requires practically no attention after being installed. Simplicity of design, construction, and operation is the basis for the success of modern equipment.

Because of its simplicity, component parts of the Masterphone are permitted to be made stronger, more durable. Receiver and transmitter are designed as a single unit with no cord connections.

Because it is balanced—the user unconsciously holds the handphone in the correct position for speaking. The voice travels in a straight line to the diaphragm, thus maintaining its natural tone qualities.

A Survey of Synthetic Camphor With Check-list of Patents

By Ibert Mellon, M. Sc.

INDUSTRIAL importance of camphor to the plastics industry as a plasticizer cannot be overestimated from either the technical or the commercial point of view. Prior to the World War Japan, through its control of Formosa, was able to dictate prices and quantities to the rest of the world. Germany even before 1914, appreciating the importance of camphor, made desperate efforts to produce it synthetically. These efforts were finally crowned with success and the German Schering interests became a real competitor of the natural product. No longer was the Japanese Monopoly able to raise or lower prices at will. In this country the Monsanto Chemical Works endeavored to fill the breach during the War. With the end of the hostilities came the end of this effort to raise up a domestic synthetic industry—the tariff protection asked for was refused. For the past ten years abortive attempts by various interests in this country to produce on a commercial scale have signally failed.

When in 1930 the new Tariff Act was passed the framers left open the gate for a domestic production by providing for a tariff of five cents a pound on synthetic camphor and one cent a pound for crude natural, such protection to run for a period of three years. Further, it was enacted that "If the President finds (at the end of three years) that during the preceding six months the domestic production by quantity of synthetic camphor did not exceed 25 per cent. of the domestic consumption thereof by quantity, or, at the end of four years after the enactment of this Act, that during the preceding six months such domestic production did not exceed 50 per cent. of such consumption, he shall by proclamation so declare and, after six months thereafter, the rate on synthetic camphor shall be one cent per pound." To assist the President the Tariff Commission was empowered to make full investigation.

At the time the 1930 Tariff Act was framed a small company in New Jersey was endeavoring to produce synthetic camphor. These efforts, however, soon came to an end and nothing further was heard of a domestic industry until early this year when Lammot du Pont, president of E. I. du Pont de Nemours & Co., announced in his annual message to the stockholders that their company was ready to produce.

Within the past 60 days the Tariff Commission has conducted its investigation and reports that the necessary 25 per cent. was being produced and that, therefore, the rate of five cents remains unchanged for the present at least.

The industrial importance of camphor may be seen from a glance at the accompanying table of imports. It is important to bear in mind that but 10 per cent. of our total imports are used medicinally, 66 per cent. are consumed in pyroxylin. In normal times the estimated total world production of synthetic camphor amounts to about 15,000,000 pounds and the natural about 10,000,000 pounds.

Importations of Camphor into the United States (in pounds)

Year	Synthetic	Natural	Total	Per cent. of Synthetic
1926.....	2,944,478	3,188,750	6,133,228	47.7%
1927.....	2,933,784	3,170,565	6,104,349	48.0
1928.....	2,264,916	5,540,708	7,805,624	29.0
1929.....	3,957,282	5,635,235	9,592,515	41.3
1930.....	2,393,691	2,089,977	4,483,668	53.5
1931.....	1,828,091	3,125,672	4,953,763	36.8
1932.....	1,459,674	2,833,260	4,292,954	34.0
1933*	267,500	1,941,895	2,209,401	12.1

*Up to and including July 1933.

The synthetic camphor of commerce is by no means built up from simple compounds as the name implies. Technically it is derived from pinene, the principal component of American oil of turpentine, which in molecular structure is almost similar to camphor. When the pinene molecule is subjected to a few minor chemical changes it is transformed to the camphor molecule.

Camphor is synthesized from turpentine by the following reactions: Turpentine $\xrightarrow{\text{acid}}$ α -pinene $\xrightarrow{\text{acid}}$ bornyl chloride $\xrightarrow{\text{base}}$ camphene $\xrightarrow{\text{base}}$ isobornyl formate $\xrightarrow{\text{acid}}$ isoborneol $\xrightarrow{\text{base}}$ camphor. The numerous patents for the making of camphor are practically all based on two methods.

One method aims at the formation of pinene hydrochloride from turpentine. Then isobornyl ester is produced and finally camphor results. The other process deals with a chemical reaction between turpentine and an organic acid. Here isobornyl ester is also formed and camphor is the end product. A third method employs camphene as the starting point. A purely synthetic means of making camphor starts with camphoric acid. This has been built up from simpler substances by synthetic means. Komppa (Ber. 1901, 34, 2472) synthesized camphoric acid by condensing methyl oxalate with ethyl $\beta\beta$ -dimethyl-glutarate. This and several other reactions resulted in the formation of camphoric acid. Perkins and Thorpe (J. C. S. 1906, 89, 795) produced camphoric acid by a series of reactions starting with 2:2 dimethylcyclopentan-1-one-3-carboxylic acid.

Process of Making Artificial Camphor, U. S. P. 582,221 (1897)
O. Nagel.

Anhydrous commercial turpentine is treated with dry hydrochloric acid gas. The pinene hydrochloride formed is then distilled with lime to form camphene. The nitric acid oxidation of camphene yields camphor. A sketch and description of the equipment is given.

Process of Producing Camphor, U. S. P. 698,761 (1902)
N. Thurlow.

Five parts of dry turpentine are mixed with one part of anhydrous oxalic acid. This mixture is heated to about 125° C. and the resulting product then heated with lime. The borneol and camphor formed are separated by distillation. The borneol can then be converted to camphor by oxidation.

Manufacture of Synthetic Camphor by Means of a Liquid Catalyst, U. S. P. 1,641,579 (1927). L. Darrosse and E. Darrosse.

A mixture of a liquid catalyst (halogenated hydrocarbon), turpentine, and anhydrous oxalic acid are heated to a temperature of 115° C. The chief constituent formed is bornyl oxalate.

Example No. 1: 40 parts anhydrous turpentine
20 parts carbon tetrachloride
5 parts anhydrous oxalic acid

This mixture is refluxed for 7 hours. There is reference made to French patents No. 303,812 (1900) and 393,478 (1908).

Process of Securing Certain Derivatives of Terpenes, U. S. P. 1,380,414 (1921). W. B. Pratt.

Anhydrous turpentine and oxalic acid are digested at atmospheric pressure or above and at 150° C. Fractional distillation yields light oils, dipentene, oil of eucalyptus and camphor series.

Manufacture of Synthetic Camphor, U. S. P. 1,733,218 (1929). L. Dupont.

A mixture of one part dry oxalic acid, four parts rectified turpentine and eight parts of a mixture of toluene-benzene is heated to 110°C. for six to eight hours.

Process of Making Camphor. U. S. P., 770,940. K. Stephan and P. Hunsolz.

Ten kilos of isoborneol are dissolved in ten kilos of benzene and stirred with a solution of ten kilos of potassium permanganate in one cubic meter of water at ordinary temperature until the color is discharged. The camphor is separated by steam distillation and crystallized from petroleum ether.

Bornyl Esters and Process of Making Camphor. U. S. P., 779,377 (1905). B. R. Seifert.

Equal parts of salicylic acid and French turpentine oil are heated at 110° C. for 50 hours. The excess salicylic acid is removed with cold soda solution and the excess turpentine is removed by steam distillation. The salicylic ester of borneol is hydrolyzed and the liberated borneol is oxidized to camphor.

Process of Making Camphor. U. S. P., 790,601 (1905). K. Stephan and P. Hunsolz.

One hundred twenty-seven parts of isobornyl acetate are dissolved in 2,000 parts of glacial acetic acid and then oxidized with 78 parts of chromic acid.

Process of Making Camphor. U. S. P., 801,483 (1905). K. Stephan and P. Hunsolz.

Ten kilos of isoborneol are dissolved in 40 kilos of petroleum-ether, then 10 kilos of water and a quantity of ozone, necessary for oxidation, are added at ordinary temperature. When the reaction is complete a portion of the petroleum-ether is distilled off and the camphor crystallized.

Process of Making Camphor. U. S. P., 801,485 (1905). K. Stephan and P. Rehlander.

One way to make camphor is to heat one kilogram of isoborneol to 160° C. to transform it into a vapor and passing this vapor together with oxygen over heated copper. The camphor formed sublimes and the unaltered isoborneol is again passed over hot copper. There are other examples.

Process of Making Camphor. U. S. P., 802,792 (1905). Lorenz Och.

Isoborneol dissolved in benzene is subjected to oxidation by an aqueous solution of chlorine. There are a number of examples given.

Process of Making Camphor from Isoborneol. U. S. P., 849,018. (1907). C. Philipp.

Five grams of sodium nitrite are added to 125 kilograms of nitric acid (sp. gr. 1.4), then 25 kilograms of isoborneol are stirred into this solution a little at a time. The temperature is maintained at 40° C.

Process of Making Camphor. U. S. P., 864,162, (1907). C. Glass.

Camphene, isoborneol and borneol are oxidized to camphor by means of an aqueous solution of bleaching power or hypochlorite with or without a catalyst.

Process of Making Camphor. U. S. P., 898,943 (1908). A. Wack.

Fifty parts of isoborneol are dissolved in 100 parts of benzol and are mixed with an aqueous solution of sulfonilic acid (15:500). This mixture is refluxed and to it is added a mixture of 100 parts sodium chromate, 200 parts water and 100 parts of sulphuric acid (95%).

Process of Making Camphor. U. S. P., 901,708, (1908). J. Hertkorn.

Isoborneol or camphene or a solution of the same is oxidized by a mixture of lime, sodium hypochlorite, copper sulphate or chloride and iron sulphate or chloride with the aid of heat. Camphor is then separated from the resulting product by steam distillation.

Process of Making Camphor. Reissue U. S. P., 13,001, (1909). C. Glaser.

Camphene, isoborneol or borneol is oxidized by an aqueous solution of calcium hypochlorite.

100 parts isoborneol

120 parts bleaching powder

2400 parts water

The mixture is heated by steam and as the temperature rises to the boiling point of the liquid pure camphor distills over.

Process of Oxidizing Borneol to Camphor. U. S. P., 990,247 (1910). G. Austerweil.

One kilogram of borneol is added slowly to 1½ kilograms of nitric acid (37° Be.) containing 2 grams of ammonium metavanadate. The temperature is maintained at about 40° C. The camphor is separated by this mixture into a dilute solution of an alkali and then distilling with steam.

Process for the Manufacture of Camphor. U. S. P., 989,651, (1911). J. Schmitz and G. Stalmann.

Twenty-five kilograms of isoborneol are heated for 10 hours with 25 kilograms of caustic soda and 50 kilograms of manganese peroxide at 250° C. The camphor is separated by steam distillation.

Process of Preparing Camphor. U. S. P., 994,437, (1911). O. Oschan and W. Kempe.

Isoborneol is oxidized by heating (230° C.) in paraffin or xylol with some powdered nickel.

Process for Effecting Reduction of Fatty or Other Organic Compounds. U. S. P., 1,134,746, (1915). E. Kayser.

Hydrogenation of an organic compound in the presence of a metallic catalyst.

Oleic acid + Borneol + Ni \rightarrow Stearic acid + Camphor + Ni

Process of Treating Organic Compound by Electrolysis. U. S. P., 1,225,052, (1917). A. Piguet.

This invention deals with the oxidation of organic compounds by means of electrolysis. Isoborneol dissolved in benzene mixed with an alkaline solution of potassium permanganate is subjected to electrolysis.

Method of Producing Synthetic Camphor. U. S. P., 1,313,661, (1919). R. L. Andreau.

Isoborneol is slowly added to nitric acid (sp. gr. 1.4) containing ferric chloride, bromine and perchloric acid. The temperature is not permitted to rise above 40° C.

The quantities used are one kilogram of nitric acid (sp. gr. 1.4) 10 grams of ferric chloride, 10 grams of bromine, 10 grams of perchloric acid and 250 grams of borneol.

Method of Changing Isoborneol into Camphor. U. S. P., 1,324,140, (1919). R. L. Andreau.

Isoborneol is oxidized by means of nitric acid with the aid of the electric current. There is given a detailed description of the apparatus used.

Process for the Production of Synthetic Camphor. U. S. P., 1,326,248, (1919). R. L. Andreau.

One kilogram of isoborneol is first subjected to oxidation by nitric acid (sp. gr. 1.4) at 80° C. Then 25 kilograms of isoborneol are slowly added.

Process of Oxidizing Isoborneol to Camphor. U. S. P., 1,347,071, (1920). R. L. Andreau.

This patent deals with the oxidation of isoborneol with a mixture of nitric and sulphuric acids.

Production of Camphor. U. S. P., 1,458,993 and 1,458,992, W. T. Scheele.

Camphor is made by the reduction of camphoric acid with a finely divided metal. Camphoric acid dissolved in ethyl alcohol is heated to 50° C. Then finely divided iron is added. Other metals like copper, aluminum or other oxidizable metals may be used.

Process of Making Camphor. U. S. P., 1,518,732, (1924). J. Ebert.

Camphor is produced by the oxidation of isobornylesters by the use of chromic acid or permanganates.

10 kilograms isobornylacetate

10 " water

10 " caustic soda

10 " manganese binoxide

This mixture is heated in an iron reflux container for 10 hours at 190° C. The camphor is separated by steam distillation.

Process of Making Camphor. U. S. P., 1,597,877, (1926). H. D. Gibbs and A. W. Francis.

Isoborneol vapor is mixed with air in the proportions of one gram of isoborneol to about a liter of air. This mixture is passed over an oxidation catalyst, such as vanadic oxide in powdered form or upon a carrier such as pumice, at a temperature of about 300° C. Other proportions of isoborneol and air and other catalysts are given.

Process for the Production of Camphor from Isoborneol. U. S. P., 1,607,453, (1926). H. Gammy.

One thousand five hundred kgs. of isoborneol are stirred with 2,500 kgs. of water and 50 kgs. of benzene. Then a solution is gradually added consisting of 1,000 kgs. of sodium bichromate, 1,350 kgs. of sulphuric acid (66° Be) and 2,700 kgs. of water.

Method for Making Camphor from Borneol. U. S. P., 1,710,573, (1929). H. Gammy.

One hundred parts of isoborneol are dissolved in 10 parts of xylene and the solution is refluxed with 5 grams of graphite and 5 grams of calcium hydroxide for three hours.

Synthetic Camphor. U. S. P., 1,733,218. L. Dupont.

Pinene contained in turpentine is converted to bornyl ester by the action of oxalic acid and a mixture of benzene and toluene. The ester is then saponified to borneol and finally oxidized to camphor.

Borneol. U. S. P., 1,766,369. H. P. Bassett and R. C. Morrison.

Pinene hydrochloride, an aqueous solution of sodium hydroxide, and a solution of sodium chloride are agitated and heated in a closed container to a temperature of 135° C. The resulting product is isoborneol, camphene and some borneol.

Derivative of Pinene and Process of Producing Same. U. S. P., 726,783, (1903). N. Thurlow. U. S. P., 833,095 (1906).

Three hundred fifty pounds of rectified and dehydrated turpentine are heated with about 70 lbs. of anhydrous oxalic acid to about 125° C. The resulting oil is a complex mixture of dipentene, pinyl formate, pinyl oxalate and free camphor. The constituent parts can be separated by successive distillation.

Process for the Preparation of Borneol esters from Turpentine. U. S. P., 901,293, (1908). J. Hertkorn.

One hundred fifty kilos of anhydrous rectified oil of turpentine, 50 to 100 kilos of ethyl or methyl alcohol, and 25 kilos of finely powdered boric acid are refluxed for 12 hours. The temperature is raised slowly to 176° C. The boric esters of borneol and isoborneol can by the action of water be separated into boric acid and borneol.

Process for the Manufacture of Acid Esters of Cyclical Terpene Alcohol. U. S. P., 907,941, (1908). O. Zeitschel.

One hundred thirty-six kgs. (1 mol.) of French turpentine oil are heated with 60 kgs. of acetic acid (1 mol.) in an autoclave at 200° C. for 5 hours. This reaction yields 10-15% camphene, 30-40% limonene and about 40% acetate of borneol. In another example benzoic acid is used instead of acetic acid.

Process for the Manufacture of Borneol and Camphene. U. S. P., 1,426,036, (1922). B. T. Brooks.

Dehydrated turpentine or an oil rich in pinene is treated with dry gaseous hydrochloric acid and the temperature is maintained between 0-5° C. The resulting product is then dissolved in glacial acetic acid to which is added fused sodium acetate.

100 kilos of crude pinene hydrochloride

225 liters of glacial acetic acid

55 kilos of fused sodium acetate

This mixture is heated at 180° C. for six hours. The excess acetic acid, camphene and bornyl acetate are separated by fractional distillation.

Manufacture of Borneol Ester. U. S. P., 1,640,639, (1927). H. Blum.

One hundred kilos of rectified French spirit of turpentine are mixed with 50 kilos of ortho-benzoyl-benzoic acid and heated to 140° C. Condensation occurs quickly. The excess turpentine is then distilled off. The residue bornyl-benzoyl-benzoate is saponified with caustic soda and the borneol is separated by steam dis-

tillation. In another example American turpentine and naphthoyl-benzoic acid is used.

Process for the Manufacture of Isobornyl Oxalates from Camphene. U. S. P., 876,310, (1908). A. Bischler and A. Baselli.

A solution of 100 parts of camphene and 100 parts of anhydrous oxalic acid in 300 parts acetone are mixed with 5 parts of sulphuric acid. This mixture is allowed to remain at 20° C. for 3 days. Then the acetone is distilled off, the sulphuric acid neutralized with sodium carbonate, the excess oxalic acid is removed with hot water, and the remaining acid bornyl-oxalate is removed with a solution of sodium carbonate.

Manufacture of Camphol Esters. U. S. P., 907,428, (1908). A. Verley and E. Urbain.

Esters of camphol such as bornyl acetate are made by heating a mixture of 100 parts of camphene and 100 parts glacial acetic acid in 60-66% sulphuric acid for one hour at 25° C. The mixture is then poured into a separating apparatus. The upper layer is about 99% camphol acetate and the lower layer is sulphuric acid and used acetic acid.

Preparation of Camphene. U. S. P., 937,928, (1909). O. L. A. Dubose.

Three hundred forty-four parts of pinene hydrochloride are heated with 65 parts of metallic zinc and 169 parts of peroxide of barium at a temperature of 130° C. for 24-36 hours. The resulting camphene is oxidized to camphor at 105° C. by "chromic-sulphuric-liquor" containing 1/1000 vanadium chloride.

Process of Making Acetyl Isoborneol. U. S. P., 1,420,399, (1922). R. L. Andreau.

A mixture of 100 kgs. of glacial acetic acid, 1.5 kgs. of sulphuric acid 95% and 40 kgs. of camphene are heated to 55° C. for three hours. Then 2.5 kgs. of anhydrous sodium acetate are added and the excess acetic acid is distilled off. There remain acetyl isoborneol and neutral sodium acetate. The latter is washed out with water leaving acetyl isoborneol.

Process of Making Borneol. U. S. P., 826,165, (1906). A. Hesse.

0.2 kilogram of ethyl bromide is dissolved in 0.8 kilogram of dry ether and poured over 1.4 kilograms of magnesium. Before the reaction is complete, 10 kilograms of pinene hydrochloride dissolved in 6 kilograms of dry ether are allowed to flow over the mixture. When the reaction is complete, ice and dilute acid are added. Borneol separates out in the upper ethereal layer.

Process of Producing Borneol-esters. U. S. P., 903,047, (1908). E. Bergs.

One hundred parts of pinene hydrochloride, 54 parts of zinc acetate and 150 parts of glacial acetic acid are refluxed for about one hour. The excess acetic acid is distilled off and the mixture of esters is distilled over under reduced pressure.

Process of Making Isobornyl Esters. U. S. P., 910,978, (1909). C. Weizmann.

A mixture of 100 parts pinene hydrochloride, 300 parts glacial acetic acid and 30 parts zinc dust is gently boiled in a reflux apparatus for about 20 hours. The excess acetic acid is removed by distillation and isobornyl acetate is separated by pouring the residual oil into water.

Process of Producing Isobornyl Esters. U. S. P., 919,762, (1909). C. Philipp.

Pinene hydrochloride, formic acid and zinc oxide are heated in a reflux condenser. The process is complete in a short time and the resulting oil is poured into water. The oil floating on the surface is then subjected to distillation which serves as a means for the separation of isobornyl formate.

Process of Making Borneol and Borneol Esters from Pinene. U. S. P., 986,038, (1911). G. Austerweil.

Equi-molecular weights of pinene and any poly-substituted organic aromatic acid such as nitrophthalic acid 1, 2, 3 are heated in an autoclave under pressure in an atmosphere of carbon dioxide. In another example 1, 3, 4 dichlorobenzoic acid is used.

Process of Producing a Mixture of Camphene and Isobornyl Acetate from Pinene Hydrochloride. U. S. P., 1,105,378, (1914). C. Ruder.

One hundred seventy-two parts of pinene hydrochloride are heated with 500 parts of glacial acetic acid and 120 parts of anhydrous zinc acetate for 4 hours at 100° C. Then 98 parts of potassium acetate are added and the excess acetic acid is distilled off.

Conversion of Pinene Compounds into Isobornyl Ester and Camphene. U. S. P. 1,372,382 (1921). L. G. Wesson.

One hundred parts of pinene hydrochloride are mixed with 300 parts of glacial acetic acid, and 2-3 parts of coarse zinc powder are heated in a reflux condenser for about 18 hours. This reaction yields isobornyl acetate, camphene, camphene hydrochloride and a little resin.

Manufacture of Borneol. U. S. P., 1,415,340, (1922). A. Haller.

Forty kgs. of tetra-chlorophthalic acid are refluxed with 160 kgs. of crude pinene for 16 hours gradually raising the temperature to 140° C. The uncombined material is removed by steam distillation. The resulting dibornyl ester of tetra-chlorophthalic acid is a solid and has the brilliancy of glass. Borneol is separated by alcoholic soda saponification.

In U. S. P., 1,429,342 Haller uses tetra-halogen-phthalic acid.

Production of Camphoric Acid. U. S. P., 1,458,992, (1923). W. T. Scheele.

Pinene is treated with sodium peroxide. There is produced a pinene peroxide which reacts with water to produce camphoric acid. This acid can be reduced to camphor.

10 parts of sodium peroxide in absolute ethyl alcohol (10%).
90 parts of pinene.

These two are mixed and heated in an autoclave at 70° C. for 2 hours. This reaction is very energetic and requires cooling.

Process of Making Isobornyl Ester. U. S. P., 1,555,947, (1925). J. Ebert.

Pinene hydrochloride made by the action of dry hydrochloric acid gas upon turpentine is dissolved in glacial acetic acid. To this solution is added metallic tin and copper. This mixture is then refluxed at 120° C. for 15 to 20 hours. The excess acetic acid is distilled off and the resulting mixture is poured into water to separate the isobornyl acetate.

Metallic zinc and iron may be used in place of metallic tin and copper.

Process of Producing Terpene Alcohols. U. S. P., 1,478,690, (1923). R. L. Andreau.

172.5 kgs. of pinene hydrochloride made by the action of dry hydrochloric acid gas upon anhydrous turpentine are added to a still containing an alkali metal salt of a phenol (400 kgs. cresylic acid, 40 kgs. of a solution of caustic soda in 70 kgs. of water). This mixture is heated at 140° C. for four hours. The camphene produced is separated by steam distillation.

One hundred kgs. of camphene are then heated with 250 kgs. of glacial acetic acid and 10 kgs. of 95% sulphuric acid for a few hours at 55° C. The acetyl isobornyl formed is separated by pouring the mixture into water. There is a detailed description of the apparatus used.

Process of Oxidizing Camphol for the Making of Camphor. U. S. P., 908,171, (1908). A. Verley and E. Urbain.

One hundred parts of camphol are dissolved in 400 parts of carbon-tetrachloride and mixed with an oxidizing agent consisting of 50 parts sodium bichromate, 50 parts water and 68 parts sulphuric acid 66°Be. This mixture is agitated for two hours.

Refining of Camphor and Apparatus Therefore. U. S. P., 247,793, (1881). W. H. Atkinson.

Process of Refining Camphor. U. S. P., 390,523, (1888). M. J. Schreiter.

Crude camphor is dissolved in camphor oil and then filtered and crystallized.

Process of Purifying Camphor. U. S. P., 574,725, (1897). J. R. France.

Camphor is dissolved in naphtha in a vessel constructed of zinc. The vessel is undisturbed until the foreign matter sinks to the bottom. The naphtha solution is then drawn off and filtered.

Part of the naphtha is removed by distillation. The camphor is then removed by crystallization.

Process of Refining Camphor. U. S. P., 610,664, (1898). W. Schmidt.

Camphor is dissolved in a solvent that is immiscible with water. The impurities are removed by filtration and the greater part of the solvent is removed by distillation. The camphor is obtained by crystallization.

Process of Purifying Camphor. U. S. P., 1,308,398, (1919). J. E. Crane.

Camphor is heated for about one hour at 400° C. in a closed retort. This treatment modifies the solubility of the camphor oil, and resinous material and leaves the camphor unaltered. Camphor is then removed by means of a solvent.

Purification of Crude Synthetic Camphor. U. S. P., 1,401,709, (1921). J. M. Kessler.

Synthetic camphor made from pinene hydrochloride is molten with salts of alkaline earth metals such as zinc or lead resinate. These salts accelerate the decomposition of organic chlorides and combine with the liberated chlorine. The camphor is then removed by distillation.

Process and Apparatus for Purifying Camphor. U. S. P., 1,486,097, (1924), 1,693,243, (1928), 1,486,377, (1924). E. G. Loomis.

These inventions give a detailed description of a method and the apparatus used for removing objectionable impurities from camphor.

Process for the Recovery of Camphor and Naphthalene Contained in Gaseous Mixtures. U. S. P., 1,613,218, (1927). J. H. Bregest.

Process of Refining Camphor. U. S. P., 1,468,371, (1923). R. L. Andreau.

Crude or synthetic camphor is fractionally distilled. There is a detailed description of the apparatus used.

Process of Purifying Crude Synthetic Camphor. U. S. P., 1,482,899, (1924). J. M. Kessler.

Crude synthetic camphor containing some pinene hydrochloride is dried and then heated to 230° C. in an autoclave at 30 lbs. pressure. The liberated hydrogen chloride gas is allowed to escape. The pure camphor is then distilled and condensed.

References

- Am. Chem. J., 43, 254-78.
Am. J. Pharm., 87, 59-61 (1915); 79, 349-56.
Apoth. Ztg., 30, 14 (1915).
Bull. Soc. Ind. Rouen, 48, 90-1 (1920).
Bull. Soc. Chim., 35, 1-16 (1924); 9, 49-6, 733-5.
Bull. Inst. Pin., 1929, pages 15-30.
Chem. Ztg., 31, 1198.
Chem. Eng., 9, 165.
Chem. News, 100, 45; 132, 375-8 (1926).
Chim. Ztg., 45, 118-21 (1921).
Chem. Age (N. Y.) 30, 211-2 (1922).
Chem. Age (London) 9, 114-6 (1923).
Chem. Trade J., 498-9 (1926).
Chemist & Druggist, 105, 403-5 (1926).
J. Chem. Soc., 97, 836-9 (Komppa's Synthesis of Camphoric Acid).
J. Chem. Soc., 99, 2010-2.
Chemical Abstracts, 1929, page 129.
Chemical Abstracts, 1928, page 412.
Caoutchouc & Gutta-percha, 21, 12489 (1924).
Compt. rend., 150, 925-7.
Kunststoffe, 4, 1-4, 24-5.
Industria Chimico, 5, 384-9 (1929).
Industria Chimico, 5, 740-2 (1930).
Ind. Chemist, 5, 507 (1929).
Industrie Chimique, 9, 113 (1922); 13, 57-60 (1926).
Pharm. Weekblad, 1908, 1001-9.
Metallborse, 18, 1013-14, 1069-70 (1928).
Rev. Chim. Ind., 17, 255-6.
Rev. Gen. Chim., 10, 421; 11, 2-9; 12, 146, 192.
Rev. Prod. Chim., 21, 50-2, 369-72, (1918).
Technique Moderne, 18, 170-2 (1926).

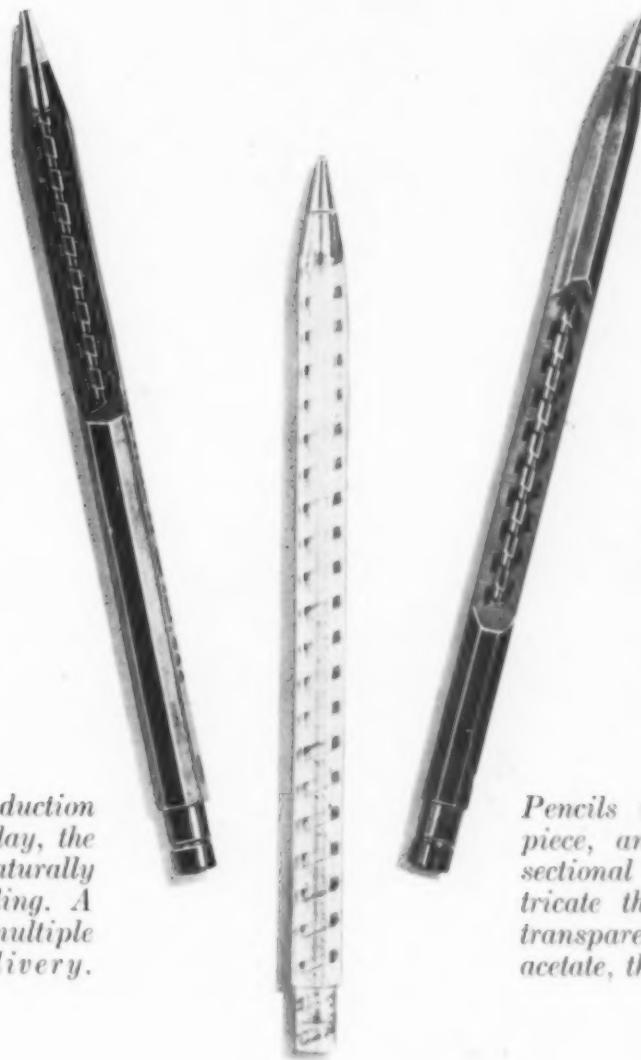
French Patents	British Patents	German Patents
636,809 (1927)	201,332 (1922)	161,523 (1904)
640,846 (1927)	300,130 (1927)	194,767 (1905)
398,361 (1904)	271,555 (1926)	230,671 (1906)
	310,055 (1926)	205,295 (1906)
	26,708 (1904)	205,849 (1906)
	9,550 (1905)	207,155 (1906)
	17,573 (1906)	185,933 (1906)
	16,429 (1905)	187,648 (1906)
		189,261 (1906)
		218,989 (1906)

Books

- F. Heusler—The Chemistry of Terpenes.
A. O. Aschan—Chemie der Alicyclischen Verbindungen.
O. Wallach—Terpene and Camphor.
B. T. Brooks—The Chemistry of the Non-Benzoid Hydrocarbons.



Transfer Molding Makes Eagle Pencils



With a necessary production of 30,000 pencils per day, the Eagle Pencil Co. naturally turned to transfer molding. A 24 cavity mold, with multiple gatings, insured delivery.

Pencils were molded in one piece, and the accompanying sectional views show the intricate threaded arbors. The transparent pencil is cellulose acetate, the others are phenolic

THE SHAW INSULATOR COMPANY

*Producers of the finest in molded parts
for over forty years*

150 Coit Street

Irvington, N. J.

Plastics in



Added to the Beeleware line of tumblers is a massive 26 oz. size for milk shakes. Produced by Diemolding Co.

To stimulate Christmas sales the Pioneer Suspender Co. packages its belt and buckle sets in a cigarette humidor box, molded of Durez, with a Buller silver-finished lid. Besides serving a dual purpose the box is especially attractive and should be a huge incentive to increased sales. Molded by American Insulator Corp.



The well dressed man this fall will carry a telling effect in the construction of this polished hard wood is used for the stick pipe the depth and lustre of cloudy amber. A g

in Pictures



This fall will carry a walking stick. Two Bakelite materials have been used with construction of this cane. Bakelite Laminated in an exact simulation of highly colored wood for the stick proper, and the handle is of Bakelite Transparent, possessing a lustrous amber. A gold band lends a finishing touch of refinement.

A new cleansing cream makes its bow to feminine America packed in a green and black molded Durez jar. No carton is used to protect the jar and for this reason the integral color and non-fragile qualities of the plastic jar are particularly valuable. The brand and product name are molded into the top of the cover and wiped in with pigment.



Furnishings of room above are all made of Cellophane materials and portray the suitability of these materials for interior decoration. We should like to give this room the monicker "Cellophane Room" and should you be in Atlantic City step in to the Du Pont Exhibit on the Boardwalk and view it.



CALCO BLACKS

If you are looking for something exceptional and unusual in Condensation Blacks—Why not try one of our new types.

CALCO CONDENSATION BLACK 1500V
CALCO CONDENSATION BLACK 1630M

These two Blacks are new developments of our Research Department. Condensation Black 1500V has been designed especially for use in phenolic resin varnishes and has the advantage of being highly soluble under all conditions.

Condensation Black 1630M is designed for use in moulding powder only, producing a more powerful and brighter black.



The Calco Chemical Company

INCORPORATED

A Unit of American Cyanamid Company

BOUND BROOK, N. J.

Boston Philadelphia New York Charlotte

P
B

A

and
triel
thre
Ned
med
meth
benz
grou
benz

In
for 3
conc
and
whic
heate
and t
The
the v

The
0.4 g
acid
added
attac
takes
ice-co
Schot
alcoh
rectic
water

Bo
benzy
benzy

The
follow
20 ho
weigh
is the

The
expose
and w
cellule
powde
again
also m
of ber
phane
15.05
absorb

Nov. 5

Properties of Benzyl Cellulose

ASIDE from patent specifications and a few other papers¹, the literature on the properties of the benzyl celluloses is comprised in two communications made to the second and seventh Congresses of the French Societe de Chimie Industrielle.² The present authors³ have carried out some tests on three grades of benzyl cellulose which were described in *De Nederlandsche Lederindustrie*—viz.: (a) high viscosity, (b) medium viscosity, and (c) low viscosity. They have devised two methods for the direct determination of the benzyl groups in benzyl celluloses, one depending on the conversion of the benzyl group into benzyl acetate, and the other on the conversion of the benzyl group into benzyl iodide.

In the first method, about 0.4 gramme of the sample is heated for 30 minutes, with 15 ml. of acetic anhydride and 5-6 drops conc. sulfuric acid until the liquid turns brown. It is then cooled and the excess of acetic anhydride decomposed by water, after which the benzyl acetate is obtained by distillation in superheated steam. The distillate is exactly neutralized in the cold, and then saponified by heating for one hour with 20 ml. *N* NaOH. The excess of soda is titrated back, and from the quantity used the weight of benzyl residue can be calculated.

The second method is an application of the Zeisel method. 0.4 gramme of the sample is distilled with 20 ml. of hydriodic acid (s. g. 1.70) in a current of dry CO₂, a little pumice being added to prevent bumping. Overheating must be avoided, as the attack is very rapid and the distillation of the benzyl iodide takes but a few minutes. The distillate is effectively cooled with ice-cold water and the benzyl iodide allowed to collect on a Schott filter containing powdered ice. The iodide is dissolved in alcohol, converted into silver iodide and weighed. A small correction is necessary for the solubility of benzyl iodide in iced water.

Both methods give identical results, and the three samples of benzyl cellulose mentioned earlier have the same percentage of benzyl group—i. e., 52.5 per cent.

The three benzyl celluloses melted with decomposition at the following temperatures: A = 295°; B = 270°; C = 220° C. After 20 hours' heating at 100° C., B. sample lost only 0.68 per cent. in weight, and at 120° C. 0.95 per cent. Excellent resistance to heat is therefore indicated.

Low Moisture Absorption

The absorption of moisture by perfectly dry benzyl cellulose exposed to atmospheres of increasing humidity has been studied, and when graphically expressed, the curve is well below that for cellulose acetate. Thus at 70 per cent. relative humidity, powdered dry benzyl cellulose absorbed 1.97 per cent. moisture against 7.5 per cent. for cellulose acetate. Absorption tests were also made at 70 per cent. r. h. at 25° C. on films of equal thickness of benzyl cellulose, nitrocellulose, cellulose acetate, and Cellophane, figures of 1.13 per cent., 2.31 per cent., 2.64 per cent., and 15.05 per cent. respectively being obtained. The low moisture absorbing properties of benzyl cellulose are very marked.

Films of the A benzyl cellulose were exposed to various concentrations of H₂SO₄ at 25° C. After a year's exposure to 50 per cent. acid there was no attack; above this concentration there was attack.

In contact with caustic soda solutions up to a concentration of 50 per cent. by weight, no attack was evident at the end of a year.

The benzyl celluloses of high benzyl content are soluble in benzene alone, but the 52 per cent. products are soluble in benzene only in the presence of 10-20 per cent. alcohol. This observation is what might be expected, and it is easy to understand that a product rich in CH₂.C₆H₅ groups will be better softened, and then better dissolved by pure benzene than a product richer in unesterified hydroxyl groups.

A solution of benzyl cellulose in benzene-alcohol will not, generally speaking, give a uniform surface, but one marked with more or less hexagonal figures. This phenomenon is not special to this type of film, but has been observed with other cellulose ester varnishes. Means for obtaining uniformly smooth films have been devised. It is necessary to inhibit eddy movements in the drying film to retard evaporation, and to introduce into the film a softening agent which will impart certain plasticity after solvent evaporation, and thus allow dispersion of the hexagonal contours first formed.

Swelling Properties

The swelling of benzyl cellulose films in pure water never exceeds three per cent. at 25° C. Swelling in water-alcohol mixtures increases regularly with the alcohol content up to 13.2 per cent. for 95 per cent. alcohol at 25° C. and after 15 days' contact.

Swelling in water-acetone mixtures increases slowly between 10-20 per cent. acetone, then increases sharply, a 40 per cent. acetone solution resulting in a swelling of 90.5 per cent. Over 40 per cent. there occurs partial solution of the film.

Swelling in aqueous pyridine increases very rapidly for solutions up to 7.5 per cent. pyridine. It then remains practically constant. For a 10 per cent. pyridine solution, swelling amounts to 92 per cent., and the adsorption of pyridine by the film runs parallel with swelling.

Swelling in aqueous phenol increases rapidly with concentration, and reaches 90 per cent. for a concentration of three per cent., and then the solution jellifies. The partition coefficient of phenol between the benzyl cellulose and water is constant for all the concentrations—i. e., 10.7 per cent.

Swelling in aqueous aniline of two per cent. strength amounts to 110 per cent. As with phenol, the fixation of aniline by benzyl cellulose is a solution phenomena obeying Henry's Law, the partition coefficient being equal on the average to 8.8 per cent.

Although it has been possible to show that benzyl cellulose lacquers do not possess any appreciable internal rigidity, the "falling ball" method of determining viscosity is applicable, provided several balls are allowed to drop successively and result taken when the time of falling becomes constant.

With regard to the influence of the solvent on viscosity, this has been shown to be at a minimum with alcohol-benzene mixtures, and minima have been found for different concentrations and for different water contents of the alcohol used. Benzyl cellulose solutions maintained at a constant temperature undergo a change with time. This is shown by a decrease in viscosity, and which is more marked as the temperature during aging is increased.

Adhesive properties using eight per cent. solutions were determined by the method recommended by the British Adhesives Research Committee, the results of which are shown below:

	Benzyl- Cellulose	Cellulose Acetate	Nitro- Cellulose
Polished brass on polished glass	11K.	3-4K.	5-6K.
" " " roughened glass	11K.	2-3K.	1K.
" " " polished copper	11K.	5K.	2-3K.
" " " oak	10K.	5K.	5-5K.



NATIONAL

RESIN COLORS

BRILLIANT UNIFORM

A COMPLETE LINE OF COLORS
SPECIALLY MANUFACTURED
FOR PLASTIC COMPOUNDS

WE INVITE YOUR PROBLEMS

NATIONAL ANILINE &
CHEMICAL COMPANY, INC.

40 RECTOR ST., NEW YORK, N.Y.

BOSTON

PROVIDENCE

CHICAGO

PHILADELPHIA

SAN FRANCISCO

CHARLOTTE

GREENSBORO

ATLANTA

CHATTANOOGA

PORLAND, ORE.

TORONTO

BRANCHES AND DISTRIBUTORS
THROUGHOUT THE WORLD

RESIN DYES



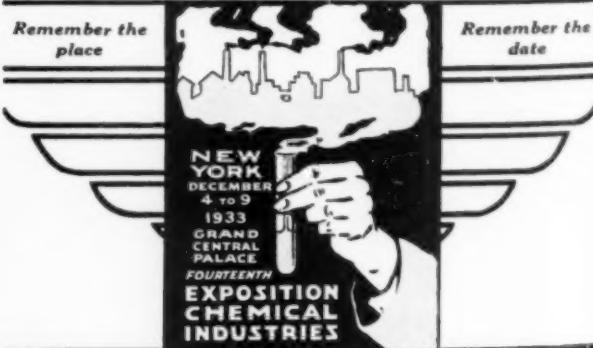
"Look into the SEEDS of TIME"

Only he may lead, henceforth—

- whose eye can pierce the veil that drapes the future
- whose mind can piece the fragments to make tomorrow whole
- whose hand can shape his course to favoring tides
- whose spirit rides to heights which early scan the dawn.

AND who may thus achieve? Who but he who knows full well what Time has wrought even to this very minute, for it is today that moulds tomorrow—today, mark you, not yesterday. And where then may one see, examine and discuss such products? Nowhere, in one place at one time, save only the contributions of chemistry and chemical engineering—the industries creative of industries, focused for one week in a panorama of progress at this year's biennial Exposition of Chemical Industries. What is new here will underlie standard practice for years to come.

He who comes, sees, studies, discusses, weighs and applies these revealing, idea-stimulating exhibits can safely count on rising high.



Management International Exposition Company

© 102

This illustrates the superior adhesive properties of the benzyl ester, and confirms the observation of the Committee that aromatic substances possess the more marked adhesive properties.

In the work on the mechanical properties of the film it was found that butanilide was an excellent plasticizer. Resistance to scratching was determined by the aid of a gramophone needle which could be loaded as desired, and by finding the minimum weight required to give a scratch deep enough to cause the film to break when subsequently bent along the channel. By this method it was found that benzyl cellulose films are less resistant to scratching than those of either nitrocellulose or cellulose acetate.

Using Guberan's plexometer, it is shown that the state of degradation of the benzyl cellulose influences considerably the resistance to bending of the film. High viscosity material is best in this respect, exceeding unplasticized cellulose acetate, but inferior to nitrocellulose cinema films plasticized with camphor.

The dielectric properties of benzyl cellulose films are very

remarkable, and breakdown voltages of films of various thicknesses are as follows:

	Observed Breakdown Volts	Thickness in Mm	Breakdown Voltage per 1 mm.
Sample 1	6,000	0.020	300,000
" 2	6,000	0.024	250,000
" 3	6,000	0.030	200,000
" 4	9,000	0.045	200,000
" 5	9,000	0.050	180,000

These figures show that benzyl cellulose has a dielectric constant per mm. thickness, which increases with decrease in the thickness of the film as tested. The ratio, breakdown voltage/thickness is not constant, but increases with decrease in thickness. The breakdown voltages are higher than those for cellulose acetate films.—*Chemical Trade Journal*.

1 Gomberg and Buchler, "J. Am. Chem. Soc." (1921); 13, 1904; Eastman Kodak, U. S. P. (1923); 1,437,820; Dreyfus E. P. 187,639; Pathé Cinema, Fr. Pat. (1925) 615,349; L. G. Farb. A.G. E.P. (1926), 265,491; Sakurada, "J. Soc. C. I. Japan" (1929), 32, 8B; Hazime Okada, "Cellulose Chem." 1931, No. 1.

2 Clement and Riviere, "Chim. et Ind." (1928), No. 4a, 670; *ibid* (1932), No. 3a, 705.

3 Prof. L. Meunier & M. Gonfard, Lyons University.

New Thermoplastic Adhesives

New cements, composed of nitrocellulose or cellulose acetate plasticizers and synthetic resin of the modified polybasic acid, polyhydric alcohol type, dissolved in suitable solvents are on the market. These cements are water-proof and very flexible, also they are resistant to the action of oils and grease—they are not affected by mild acid and alkaline solutions. They do not become brittle on aging.

The cementing operation is accomplished by means of heat. While attempts have been made in the past to perfect thermoplastic cements, no successful cements utilizing simple and inexpensive equipment for their application and use have been developed.

Due to the simplicity of the equipment required for the use of this thermoplastic cement, it is adaptable to a wide variety of uses. Where small articles are to be cemented an ordinary flat iron can be used to fuse the cement.

Briefly, the procedure for using these products is as follows: the surfaces which are to be joined together are coated with the cement. This is done by applying the cement with a brush, spray gun or with a coating machine. This coating of cement is allowed to dry thoroughly, requiring about twenty minutes at ordinary room temperature. This time, however, can be greatly reduced by drying in a warm well-ventilated drying chamber.

After the cement is thoroughly dry, the two surfaces are brought into contact and heat and some pressure are applied. This fuses the cement film which on cooling becomes hard, joining the two surfaces together and forming a strong, waterproof, flexible bond. One of the interesting advantages of these cements is that materials or articles which are to be cemented can be coated with this cement and stored for an indefinite period of time, the actual cementing operation being carried on at some future time.

In large scale production one of the surfaces is coated with the cement and allowed to dry thoroughly. The combining operation can be carried on at any future time by passing the materials through heated rolls or by placing them in a heated press.

Ordinarily, cements and glues harden through the evaporation of water or solvents. Because of this, it has been impossible to cement together large sheets of solid materials such as glass and metal. It is altogether practical to cement such materials using thermoplastic cement and a surprisingly strong bond is obtained. Metal foils, Cellophane, paper and fabrics can be combined to such materials as glass, sheet metal, wood, paper, cardboard, cork, linoleum and the like.

For instance—designs can be cut from fabrics which have previously been coated with the cement. These designs can be

attached to articles or materials merely by pressing them on with a warm electric flat iron.

Experiments carried on have demonstrated the applicability of these cements to an exceptionally large number of purposes. Some idea of the extent of the possibilities for these new products is indicated by a partial list of uses as follows:

Laminating foil to paper or Cellophane for use as food wrap.

Laminating metal foil to wooden shingles and similar building materials.

Laminating thin metal sheets to composition board or plywood for use in the construction of commercial automobile bodies, buses, etc.

Cementing foil or paper to cork to be used as inserts in bottle caps and seals.

Cementing linoleum to various surfaces.

Cementing coated fabrics to other fabrics.

Cementing leather to leather or to other materials.

Cementing fabrics to fabrics or to other materials.

Cementing metals to metals or to other materials.

Cementing paper to paper or to other materials.

Cementing wood to wood or to other materials.

Cementing metal foil to metal foil or to other materials.

Cementing glass to glass or to other materials.

Cementing Bakelite to Bakelite.

Cementing Bakelite to wood, glass, metals, etc.

Cementing vulcanized fibre to vulcanized fibre.

Cementing vulcanized fibre to wood, glass, metals, etc.

Cementing sheet cork to wood, glass, metals, etc.

Cementing asbestos to wood, glass, metals, etc.

Cementing sheets of transparent cellulose base together or with other materials.

Attaching labels to cans or bottles.

Attaching decalcomanias to various surfaces.

As a cement in the manufacture of veneered panels on plywood.

As an adhesive in the manufacture of paper bags and boxes and similar containers.

As an adhesive for the covering and binding of books.

As the adhesive for cementing Cellophane to printed signs and show-cards.

As an adhesive for laminating glassine paper to paper bags, paste board, for use in food containers.

As an adhesive for cementing fine or sheer fabrics to heavy drills for use in the manufacture of hand-bags, shoes, etc.

This new line, known as Thermoplastic Cements, of du Pont origin, has attracted the interest of many manufacturers in a wide line of products and in some cases has made possible the production of new and novel products.

CASEIN PLASTICS

NON-INFLAMMABLE SHEETS and RODS

Made in Beautifully Mottled
and Plain Colors

American Plastics
Corporation

50 Union Square

New York



CAMPHOR

SYNTHETIC

MADE FROM AMERICAN TURPENTINE

UREA

CHEMICALLY PURE • TECHNICALLY PURE



PRODUCTS OF SCHERING-KAHLBAUM, A. G., BERLIN

SHERKA CHEMICAL CO. INC.

75 WEST STREET • NEW YORK
TELEPHONE • BOWLING GREEN 9-7482

Plastics in the News

Plastic Fabricators Meet NRA Officials in Preliminary Conference—Paint Code About Ready to Sign—Chemical Exposition Opens Dec. 4—Paint Industry Show a Success—Rehearing of Lacquer Patents Suit Held—British Cyanides Acquires Pollopas Patents.

The Executive Committee of the Plastic Fabricators' Association met Oct. 25 in preliminary conference with NRA officials in Washington on code details. As a result of this conference the code will be redrafted and submitted to the entire membership of the Association for further consideration at a meeting which is to be called in N. Y. City. No date, however, as yet has been set for this meeting.

It is expected that when the members of the Association have approved the Code in the redrafted form, with such amendments as may be agreed upon at the N. Y. City meeting, that the Code will then be in a form suitable for submission at the public hearing which is mandatory under NRA law. Members of the Executive Committee are hopeful that a date for the public hearing will be definitely decided upon shortly.

Officers of the Association, Celluloid's H. I. Hill (president); New England Novelty's Harry Levine (vice-president); H. Goodman & Sons' A. Goodman (treasurer) and John E. Walker, the Association's secretary are in close contact with NRA officials and earnest efforts are being made to complete the necessary details as quickly as possible.

Paint and Alliance Codes

Washington reports strongly indicate that the paint, varnish and lacquer code is in the last stages of revision; most of the advisory boards have passed upon the code. It is hoped that the President will sign it in the last week of October; in all probability it will have received presidential benediction before this issue is in our readers' hands.

Chemical Alliance's Code is still before General C. C. Williams. Code committee members were called to Washington, Oct. 20 and after an all-day meeting with NRA officials, several changes were made. Assistant Administrator Williams has stated that when the final draft has been approved by him the code will be given publicity before being forwarded to President Roosevelt. Members of the Plastics

Manufacturers' Association—raw materials for the plastics industry—are all individually members of the Alliance.

Plastics No "Baby"

Plastics industry, "baby" of the 1931 Exposition of Chemical Industries, is now superseded by a "Brewing Section." Plastics Section promises this year (week of Dec. 4) to be unusually complete. A large number of manufacturers of plastics



America's premiere exhibit of chemical advances of the past two years will again be held at the Grand Central Palace in N. Y. City week of Dec. 4.

will be exhibitors. Subject will be made additionally clear and comprehensive through the exhibits of chemicals used in the making of plastics, and machinery used to fabricate them into finished form.

Packaging Show Plans

Fourth Packaging, Packing & Shipping Exposition, scheduled for the Hotel Astor, N. Y. City, week of March 13-16, 1934, as in previous years, will be concurrent with a succession of daily conferences and clinics dealing with consumer marketing, packaging, packing and shipping. Over 10,000 are expected to attend. Complete

program will be announced later as well as the details of the 3rd Wolf Award for the best package developed and put on the market in 1934.

Plastics industry will be represented by following: Bakelite, Celluloid Corp., Du Pont Cellophane, General Plastics, Sylvania Industrial. Packaging machinery exhibit will include Stokes & Smith.

Industrial Materials Exhibit

Industrial Materials Exhibition, held in the Florentine Room of the Park Central Hotel, N. Y. City on Oct. 23-27, attracted a large number of visitors and interest centered largely in a number of plastics exhibits. Companies in the plastics field exhibiting included Bakelite, Brown Co., Waterbury Button; Maas & Waldstein displayed a very complete line of lacquers; Spaulding Fibre showed a large variety of samples of its laminated materials; and Isolanite (extruded ceramic) a complete line of electrical insulating pieces. In the molded field several striking clock and radio cases were shown by Bakelite, Waterbury Button, and Brown Co.

Coatings

The 1933 Paint Industry Show, conducted in conjunction with the Federation of Paint & Varnish Production Clubs' Convention, at Chicago's Edgewater Beach Hotel Oct. 26-28 (paint convention week) proved to be of more than passing interest to those in the plastics field.

Advance Solvents & Chemical featured soligen driers; styrol and vinyl resins and various cellulose esters. Present were Chicago representative, C. A. Lechner, and A. B. Mullaly and C. A. Klebsattel from the N. Y. City office.

Anderson-Pritchard Oil had C. H. Dresser, director of industrial naphtha sales, Dr. James K. Stewart, head of the industrial naphtha research laboratories in Chicago, and D. D. Rubek, also from the Chicago laboratory, present at various times.

Bakelite had a very complete display booth and featured Bakelite synthetic resins. Attending were Dr. J. C. Moore (recently elected president of the paint chemists), Dr. V. H. Turkington, R. A. Brenneck, C. R. Given, Howard Smith, and Allen Brown, advertising manager.

In addition to Bakelite, a number of other important manufacturers of syn-

We are headquarters for
**PLASTICIZERS, SOLVENTS
 & RAW MATERIALS**

for the manufacture of
PLASTICS
LACQUERS
& COATINGS

The following are some of our specialties

CELLULOSE ACETATE

-
- DIBUTYL PHTHALATE**
- DIETHYL PHTHALATE**
- DIMETHYL PHTHALATE**
- DIBUTYL TARTRATE**
- TRIACETIN**
- TRIPHENYL PHOSPHATE**

-
- CRESYLIC ACID**
- SODIUM ACETATE**
- ACETIC ANHYDRIDE**

CASEIN

**AMERICAN-BRITISH
 CHEMICAL SUPPLIES, Inc.**

180 Madison Avenue New York, N. Y.
 Telephone Ashland 4-2265

Affiliated Companies:

KAY-FRIES CHEMICALS INC.

(Manufacturers of Organic Chemicals)
 New York City and West Haverstraw, N. Y.

**CHAS. TENNANT & CO. (Canada)
 LIMITED**

372 Bay Street Toronto 2, Canada

NEW STOKES ROTARY PREFORM PRESS "DDS-2"

Talk over
 your
 Preforming
 Problems
 with us
 at
 the
CHEMICAL SHOW
 —
 Booth
 80



**It has what you want in a
 PREFORM PRESS**

Speed
 350 preforms per minute.

Versatility
 Pieces up to 1" thick; die fill up to 2"; hand wheel weight and pressure adjustments; possibility of operation with as many pairs of punches of one type as job warrants.

Quick "change-over"
 Punches lifted out; dies easily changed.

No danger of jamming
Excess Pressure Release, with spring control, spills overloads and absorbs strains.

Accuracy in Weight
 Die cavity overfilled, excess scraped off before compressing.

Uniformity in Density
 Slow squeeze from both sides simultaneously instead of sudden blow.

Cleanliness
 Dust collectors prevent part wear and loss of material.

Other Features:—Makes ball-shaped preforms; model for cored pieces available. Easily motor driven . . . Silent . . . Heavier . . . More Compact. Moving parts housed, yet accessible . . . Rugged . . . Large Bearings. V-Belt driven, if desired. Alemite lubricated.

Write for further information

FJS STOKES MACHINE COMPANY

Process Equipment Since 1895
 5934 Tabor Road Olney P. O. Philadelphia, Pa.

thetic resins had space, including Beck, Koller; Paramet Chemical; Resinous Products & Chemical; and Stroock & Wittenburg. R. B. H. Lacquer Base, Bound Brook, N. J., exhibited a large number of articles finished with lacquers containing the bases made by this company.

Commercial Solvents had a very instructive display designed to promote a wider use of lacquer by pointing out 12 points of superiority. William Mueller, sales manager, and O. R. Brimkow, assistant sales manager, were in attendance.

Other exhibitors included Binney & Smith, National Pigments & Chemical, Spencer Kellogg, Kentucky Color & Chemical, John D. Lewis, Inc., George S. Mepham, Joseph A. McNulty, Nuodex, C. K. Williams, and Reichard-Coulston.

Lacquer Rehearing

Rehearing of the appeal in the case of du Pont vs. Glidden (Flaherty lacquer patents litigation) was argued Friday Oct. 13 in the 2nd Circuit Court of Appeals Post Office Bldg., N. Y. City. Briefs were submitted by both sides and a decision is expected shortly. Albert G. Davis, former vice-president of G. E. and its general patent counsel, was added to the list of counsel appearing for Glidden.

The Circuit Court of Appeals for the 2nd District reversed the decision of the District Court for the Eastern District in favor of Glidden. On Aug. 10, however, the Circuit Court granted the petition of Glidden for a rehearing. Case has been one of the most bitterly fought in the history of the chemical and allied industries.

Rex Campbell & Co., Ltd., (England) has issued a new booklet describing use of castor oil products in lacquer manufacture. A number of these products are excellent plasticizers.

Esposito Heads Round-Table

Jos. R. Esposito, well-known Ault & Viborg official, presided over a group meeting of industrial manufacturers Nov. 1 held in conjunction with the paint conventions at Chicago. A round table discussion was held and a number of problems now facing the paint, varnish and lacquer producers were taken up. Further discussions of similar nature are expected to be held from time to time.

Beck, Koller Appoints Hovey

Beck, Koller (Detroit resin manufacturers) appointed Almon G. Hovey director of research laboratories Oct. 1. He was formerly with Remington Arms and since 1924 he has researched synthetic resins, plastics, insulation materials, and chemical products for G. E.

Cullinan With Breinig

Neil Cullinan has been appointed sales promotion manager for Breinig Brothers, Inc., Hoboken, N. J., paint, varnish and lacquer manufacturer.

Stacol, New Glyco Resin

Stacol is a new inorganic "resin" which is now being produced commercially for the 1st time by Glyco Products, Brooklyn.

It is a clear glass-like material which is soluble in water and insoluble in organic solvents, oils, etc. It is neutral and twice as heavy as water. It melts to a clear viscous liquid. Its water solutions resemble sodium silicate solutions in giving dry, hard, glossy, flexible films. They differ, however, in being neutral and unaffected chemically by acids or alkalies. Water solutions are considerably less viscous than the corresponding strength silicate solutions.

Stacol is of interest in coating and impregnating textiles, paper, wood, linoleum, leather, rubber, etc. because it imparts fire resisting, weighting, stiffening and glazing effects at a reasonable cost. It may also be used in water colors and water inks. Stacol can be rendered acid or alkaline without affecting these properties.

William A. Kingman, formerly chief chemist, Dennison Mfg., and later chemist for Lowe Paper, has established headquarters at Framingham, Mass., and will act as a special sales representative for Glyco Products, servicing special water-soluble waxes, resins, solvents, emulsifying agents, etc.

Stearates in Lacquer

Results of a series of experiments to determine action of aluminum stearate when mixed with a variety of solvents and the effect of heat on these mixtures were discussed by F. J. Licata, Metasap Chemical, at a meeting of the Western New York Paint and Varnish Production Club held in Buffalo Oct. 6.

Mr. Licata pointed out that formulators of paints, varnishes, and lacquers experience constant difficulties in their work because of the wide variations in the properties of raw materials they use and the meager amount of accurate information they can secure in regard to given lots of these materials. Much research of the kind he has been conducting is needed to provide data that will assist formulators in securing desired results without loss of time, effort, and materials.

Solvents may be divided into 2 groups according to their behavior with aluminum stearate, he found. First group, which consists of hydrocarbons, terpenes, oleic acid, and raw linseed and Chinawood oils, produce fine, almost transparent dispersions which remain suspended for a relatively long time. Second group, consisting of alcohols, ketones, esters, and ethers, produce coarse, opaque suspensions, which settle out in a short time.

Mixtures of aluminum stearate and the hydrocarbons leave films which are most desirable for flat finishes, whereas solvents producing opaque films left chalky films that are undesirable for flat work.

When mixtures of solvents and aluminum stearate are heated, reactions that are detrimental to good results in flat work usually take place. He recommended that in grinding aluminum stearate with the solvent, the temperature should be kept as low as possible. He considers a pebble mill superior to either iron or stone mills because less frictional heat is developed in this type of mill.

Harry E. Dunning, former western division sales manager for American Commercial Alcohol, is now general sales manager.

August Paint, Varnish and Lacquer Statistics

Sales of paint, varnish and lacquer products in August totaled \$20,620,811 in value, according to a preliminary report by U. S. Bureau of Census from data supplied by 586 establishments. This compared with a revised total of \$22,090,187 in July and \$16,032,441 in August a year ago. January-August sales were \$152,328,780 against \$148,947,888 in the corresponding period of 1932. A record of August sales, a comparison with the preceding months of 1933 and the entire year 1932 follows:

1933	586 establishments	Classified sales reported by 344 establishments			Trade sales of unclassified paint, varnish and lacquer sales reported by 244 establishments
		Total	Varnish	Lacquer	
1933—Jan...	\$11,275,396	\$3,529,886	\$2,386,947	\$1,142,939	\$4,168,260
Feb...	11,665,734	3,423,033	2,445,378	977,655	4,771,706
March...	13,578,568	3,391,947	2,484,550	907,397	3,788,213
April...	19,043,787	4,677,309	3,143,803	1,533,506	8,582,411
May...	26,241,044	5,991,938	4,298,455	1,693,483	11,788,573
June*	27,813,233	6,827,509	4,832,551	1,994,958	2,443,998
July†	22,090,187	6,406,184	4,493,516	1,912,668	8,627,400
August	20,620,811	6,323,475	4,754,701	1,568,774	7,840,339
Totals, yr...	\$15,894,506	.....	.....	.....	6,456,977
Comparative data not available					
1932—Jan...	16,270,822	.....	.....	.....	.....
Feb...	19,089,005	.....	.....	.....	.....
March...	22,612,193	.....	.....	.....	.....
April...	24,981,441	.....	.....	.....	.....
May...	19,637,358	4,685,399	3,617,719	1,067,680	8,734,330
June...	3,793,245	2,900,707	892,538	6,058,813	6,217,629
July...	14,430,122	3,851,028	3,057,096	793,932	4,578,064
Aug...	16,032,441	3,980,564	3,113,303	867,261	5,282,754
Sept...	16,805,712	3,996,500	3,036,323	960,177	5,216,748
Oct...	15,592,377	3,599,319	2,639,362	959,957	5,196,766
Nov...	12,492,818	3,599,319	2,639,362	5,196,766	3,696,733
Dec...	9,484,520	3,222,770	2,186,706	1,036,064	3,506,715
Totals, yr...	\$203,323,315	.....	.....	.....	2,755,035

*Revised.

Something more than chance

● Beautiful molded articles, such as this poker chip holder, don't "just happen." The Mack Molding Company, of Wayne, N. J., made sure that this article would be blemish-free, colorful and sturdy enough to withstand hard usage, by molding in Resinox.

KEEP IN TOUCH WITH RESINOX DEVELOPMENTS

RESINOX CORPORATION

Subsidiary of Commercial Solvents Corporation
and Corn Products Refining Company
230 Park Avenue, New York City



RESINOX

MOLDING RESINS • MOLDING COMPOUNDS • LAMINATING VARNISHES

JOHN J. CAVAGNARO

Engineers and Machinists

Established 1881

HARRISON

NEW JERSEY

Steel Steam Platens

This mixer constructed with many new important features desired for efficient mixing operations

Belt or Motor Drive

Complete specifications on request

Plain or Stainless



Cavagnaro-Loomis Vacuum Mixer
(Patented)

Die Presses and Dies

Complete line of machinery for Celluloid & Plastic Mfrs.

Special Representative

Evarts G. Loomis
126 So. 14th St.
Newark, N. J.

Pacific Laboratories, Portland, Ore., now producing 9,000 gals. of lacquer weekly, will increase production 15%.

Kellogg & Tree is a new firm handling industrial sales promotion problems with N. Y. City headquarters at 300 Madison ave.

Cyanamid & Chemical has opened a Detroit office in charge of George S. Horsfull.

Mid-Continent Paint & Lacquer Mfg. Co., Kansas City, Mo., has purchased Southwestern Paint & Varnish.

D. H. Litter Co. (representing Anderson-Prichard, Pacific Vegetable Oil, Falk & Co., Pure Calcium Products, Nuodex and others, has taken larger quarters at 500 5 ave., N. Y. City.

Harry Kramer, formerly with Acme White Lead & Color, is again associated with that company in its pyroxylin lacquer division.

H. Reichhold, Beck, Koller president, booked passage on the Graf Zeppelin leaving Akron Oct. 28.

United States Lacquer, 166 Coit st., Irvington, N. J., is rebuilding.

Molded

British Cyanides-Pollopas

Outstanding in the foreign plastics news of the month was the announcement that British Cyanides Co., Ltd., well-known manufacturers of Beetle Plastics, has acquired Pollopas patents controlling the manufacture of resins and molding powders of the urea-formaldehyde type for Great Britain, the British Empire (except Canada) and certain Continental countries. Company has also entered into an arrangement whereby a full exchange of patents and information will be made with other licensees of Pollopas patents in Europe, i. e., I.G. in Germany and Kuhlmann in France.

COMING EVENTS

Exposition of Chemical Industries, Grand Central Palace, N. Y. City, Dec. 4-9.

American Institute of Chemical Engineers, Roanoke, Va., Dec. 12, 13, 14.

American Management Association, 4th Annual Packaging Exposition, Hotel Astor, N.Y. City, March 13-17, 1934.

American Chemical Society, St. Petersburg, Fla., week of March 25, 1934.

These arrangements have been made to consolidate patent position and to pool existing knowledge concerning urea type plastics in order to improve their quality for the benefit of the industry.

Will Operate Separately

Later advices from England indicate that both companies will continue to operate as separate units. In a letter addressed to the Editor of *British Plastics* J. C. Vrendenburg, managing director of Pollopas, Ltd., states:

"As has been announced in the Press, this company and our associates in Germany and France have come to an understanding with the British Cyanides Co. Ltd. for a pooling of patents and technical knowledge.

"This understanding, while making for stability and progress to the great benefit of the consuming industries, will not in any way effect our hitherto sales policy and distributive arrangements. Pollopas and Beetle, as quite distinct products and with separate organizations, will continue to compete for business as before.

"It will be our aim, through service to the molder and by the high quality of our product, to deserve your continued preference for Pollopas."

A somewhat similar statement was also made by Kenneth M. Chance, managing director of British Cyanides as follows:

"In connection with the recent announcement in the Press regarding the acquisition by this company of the Pollopas patents in this country, I wish to point out that for the last 2 years Beetle and

Pollopas have competed in the markets of the world in quality, but not in price, and the remarkable development of the aminoplastic industry stands as proof of the wisdom of this policy. In future Beetle and Pollopas will compete in perfecting aminoplastic molding powders by co-operation in research and by throwing open to each the other's patents, knowledge and experience.

"The existing sales organizations for their respective products will be retained."

Will Remain Open

British Plastics Exhibit is to remain open indefinitely at the Science Museum, South Kensington, as a result of applications from the Trade Association and other groups.

Linde Air Products (30 E. 42 st., N. Y. City) is marketing a new type of safety spectacles. They are mounted in a natural canvas-Bakelite frame.

Durez Molder for October features the Coca Cola radio originated and molded of Durez by Richardson Co.

Autopoint Elects

Autopoint Co., Chicago subsidiary of Bakelite, has new officers: president, C. Lansing Hays; vice-president, Oscar F. Holmgren; treasurer, John E. Horn; general manager and sales manager, C. N. Cahill; director of manufacturing, Frank Deli; and advertising manager, Martin Higgins. Company manufactures several distinct pencil lines.

Cellulose

Following table* presents monthly statistics relating to pyroxylin-coated textiles based on data reported to the Bureau of the Census by 19 (a) identical establishments comprising most of the industry. Data given include products manufactured by spreading nitrocellulose or pyroxylin preparations, either by themselves or in combination with other mate-

*Table on page 377.

Cellulose Plastic Products

August, 1933

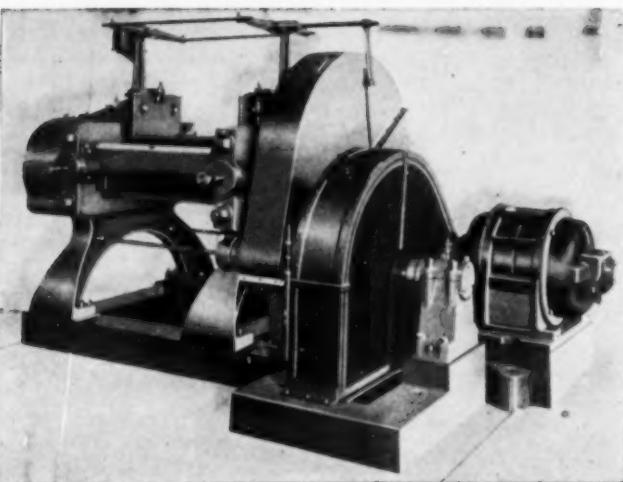
Compared with preceding months

Bureau of the Census presents, in following table, monthly statistics on production and shipments of cellulose plastic products (sheets, rods, and tubes), based on data furnished by 8 identical establishments from January to July, inclusive, and by 10 establishments for August. Comparable statistics, prior to January, 1933, segregated for nitro-cellulose and cellulose-acetate products, are not available. This report takes the place of the monthly report on "Pyroxylin Sheets, Rods, and Tubes."

Production and Shipments in Pounds

Year and month 1933	Nitrocellulose				Cellulose Acetate			
	Sheets Production	Shipments	Rods Production	Shipments	Tubes Production	Shipments	Sheets, Rods, and Tubes Production	Shipments
January	504,813	625,392	74,872	115,434	12,812	29,329	167,856	160,272
February	490,290	593,942	78,904	100,092	16,248	23,711	141,628	125,073
March	454,506	611,840	63,188	87,784	17,472	32,525	119,400	117,344
April	473,333	624,727	104,817	130,853	26,198	27,091	149,402	211,435
May	787,614	774,424	161,784	126,195	32,684	36,992	234,811	221,345
June*	912,742	959,194	156,830	139,772	41,467	45,057	242,013	220,686
July*	1,027,812	916,612	158,250	160,851	42,100	41,467	192,381	221,751
August	1,290,521	1,257,981	254,249	236,730	40,364	56,142	230,013	231,879

*Revised.



Rolls for Plastic Mixing

3

FOLLOWING CARRIED IN STOCK

6 x 16

10 x 24

14 x 30 (illustrated)

16 x 42

**Specially designed for mixing
Durez, Bakelite, Asphalts and
Shellac compound materials.**

The largest and oldest manufacturers are using our machines.

3

W.M. R. THROPP & SONS CO.
TRENTON, N. J.

Established 1888

376

Bakelite Molding



R

THE RECTO MFG. CO.

Cincinnati, Ohio

Agreston and R. St. S. R. Jr.

WOOD FLOUR

**THE MOST WIDELY-USED FILLER
FOR PLASTICS. MADE BY A
NEW PROCESS, EXCLUSIVE
WITH BECKER-MOORE, THE
LARGEST DOMESTIC SUPPLIERS.**

Bright in Color

Uniform Screen Analysis

BECKER-MOORE & CO., INC.

NORTH TONAWANDA
NEW YORK

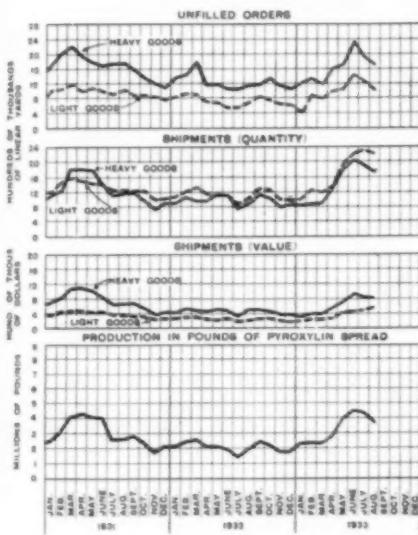
Plastic Products

Nov. '33: IX, 9

	1931 August	1932 August	1933 July	1933 August
LIGHT GOODS:				
Shipments—				
Linear yards.....	1,257,050	1,010,558	2,371,408	2,178,858
Value.....	\$340,911	\$216,090	\$504,773	\$537,841
Unfilled orders (b)—				
Linear yards.....	1,009,425	666,020	1,253,592	1,032,913
HEAVY GOODS:				
Shipments—				
Linear yards.....	1,154,517	870,269	1,908,958	1,709,846
Value.....	\$648,356	\$486,518	\$837,368	\$814,865
Unfilled orders (b)—				
Linear yards.....	1,742,038	1,118,761	1,941,755	1,718,179
PYROXYLIN SPREAD (c):				
Pounds.....	2,666,650	1,958,900	4,348,454	3,690,884
(a) Of the 19 establishments reporting for August, 1933, 3 establishments did not report prior to January, 1933.				
(b) Orders on hand at the close of the current month (reported in yards only) exclusive of contracts with shipping dates unspecified.				
(c) Based on 1 lb. of gun cotton to 7 lbs. of solvent, making an 8-lb. jelly.				

rials, upon grey goods, such as sheetings, drills, ducks, sateens, moleskins, etc. Monthly capacity of the 19 establish-

PYROXYLIN-COATED TEXTILES AUGUST, 1933 COMPARED WITH PRECEDING MONTHS



ments, amounting to 11,400,064 yards, in August, is based on a maximum quantity of 1.27 to 1.30 sateen, coated to a finished weight of 17½ ounces per linear yard, in a 24-hour working day, 26 days to a month.

In The Magazines

September-October issue of the *DuPont Magazine* features a story on the use of Cellophane for merchandizing the oldest bulk items—dried fruit and vegetables, showing that no longer need these products be "out-of-sight, out-of-mind" products.

Second edition of Brown Co.'s *Solka Age* (Oct.) is largely devoted to an account of the Century of Progress, stressing wide variety of new uses for Company's recently introduced Solka (cellulose).

Revue Generale des Natières Plastiques (France) for September has a very splendid article on the manufacture of pyroxylin (celluloid).

Continental-Diamond Fibre had the only plastic exhibit at the recent N. Y. City Radio and Electrical Show.

Nov. '33: IX, 9

Tennessee Eastman recently let a contract for a filtration unit at Kingsport.

Pyralin-Fall Handbags

Fall fashions in handbags of Pyralin are now being featured in one of the Boardwalk windows of the Du Pont Exhibit in Atlantic City. Envelope and pouch bags in black, brown and blue, in plain, striped and checked designs, by Re Mode Bag Co., of N. Y. City, are featured in simulated store windows, which were set up in the background of the display.

New Books

Chemical Economics, by Williams Haynes, 310 p., published by D. Van Nostrand Co., Inc., 250 4 ave., N. Y. City \$3.25.

Chemical Economics will prove highly instructive alike to the chemical company executive, salesman, laboratory worker, consultant, engineer—in short to every person either making a livelihood or deriving a livelihood from chemical fields. Being a history of chemical industry from the economic or dollars and cents viewpoint, the book has widespread appeal. We refrain purposely from using the term—textbook. For some unaccountable reason the term usually implies dullness. One is taken in *Chemical Economics* on an exciting, colorful journey, one full of mystery, romance, intrigue, outstanding success, and tragic failure. A novel, lavish, spectacular use of the photographer's art adds not a little to the "readability" of the book. *Chemical Economics* is not merely a recital of the happenings within the chemical industry in the past 100 years. Each step forward is skillfully interpreted and the economics involved are fully explained. We would not be at all surprised if the book proves to be a hand-book of information also to that large and growing group of Americans who are heavily investing in our chemical industry.

Industry Award Winner

Carbide & Carbon Chemicals has been awarded 1st award for chemical engineering achievement offered by *Chemical &*

Plastic Products

Metallurgical Engineering. Presentation of plaque will be made Dec. 9 at the Chemical Exposition.

New Safety Glass Cement

American Window Glass stockholders were informed at the annual meeting Oct. 17 that company had a new cement for safety glass. Material is a result of an invention of synthetic rubber in Germany during the World War.

G. E. Business Improves

G. E. has added 7,600 employees to its payrolls since March 1, and total annual payroll rate is today \$17,000,000 greater than it was on that date, Gerard Swope, president, made known in a statement to the company's 187,000 stockholders mailed with regular dividend checks.

G. E. orders for 3rd quarter amounted to \$43,733,499, compared with \$35,539,858 for 2nd quarter of this year and with \$25,665,402 for 3rd quarter of 1932, an increase over last year of 70%, President Gerard Swope announced Oct. 10. For 9 months ended Sept. 30, orders received this year amounted to \$104,785,001, compared with \$94,374,114 for 1st 9 months of 1932, an increase of 11%. No indication was given of the totals in the plastic division, but it is understood that volume has improved considerably in past few months.

New Booklet

Forestalling Labor Troubles is No. 4 in a series of booklet-editorials written by Allen W. Rucker and N. W. Pickering, president, Farrel-Birmingham Co., Inc. Copies of this interesting booklet are available by writing company's executive offices at Ansonia, Conn.

British Monsanto Power Plant

British trade journals report opening of Monsanto Chemical Works' new £70,000 power plant on Sept. 26 by H. R. H. Prince George accompanied by a distinguished group of English industrialists.

The Ruabon Works in North Wales was 1st started 67 years ago by Robert F. Graesser and entire production of phenol only amounted to a few hundred pounds weekly. At present plant production is said to be larger than the combined output of all other British makers. In addition to phenol a very complete line of coal tar chemicals is produced.

Monsanto's interest in the Graesser firm was 1st stimulated because it furnished years back raw materials for a long list of important coal tar chemicals made at St. Louis. A minority interest in the British firm was acquired and finally complete ownership. With this came a change in name to Monsanto Chemical Works, Limited.



FORMALDEHYDE PARA FORMALDEHYDE HEXAMETHYLENAMINE

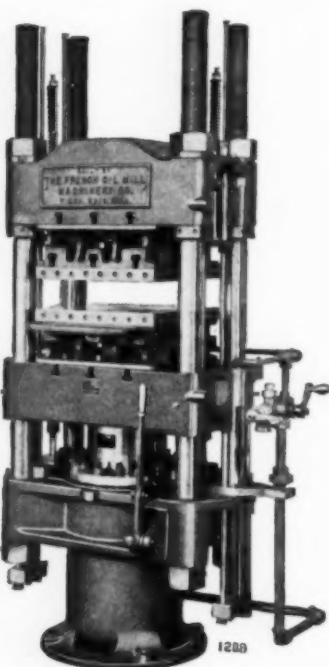
Long experience in the manufacture of these products enables us to meet the individual requirements of the Plastic Trade.

HEYDEN CHEMICAL CORPORATION

50 UNION SQUARE
180 N. WACKER DRIVE
GARFIELD, N. J.

NEW YORK CITY
CHICAGO, ILL.
Factories
PERTH AMBOY, N. J.

FRENCH HYDRAULIC MACHINERY



- Semi-Automatic Presses
- Hand Presses
- Tilting Die Presses (patented)
- Hot Plate Presses
- Valves
- Controls
- Pumps
- Accumulators



Molding Presses for all compounds of all sizes and types.

THE FRENCH OIL MILL MACHINERY CO. PIQUA, OHIO

Plastic Patents

Phenol

Phenol resin composition. No. 1,717,600. Disclaimer with exceptions filed by Assignee, Bakelite Corporation.

Phenolic condensation product and process for making a potentially reactive molding mixture by effecting a reaction between a non-reactive phenol resin and an inorganic base. No. 1,924,514. L. V. Redman, A. J. Weith & F. P. Brock to Bakelite Corp.

Method of making free phenol, without acidification of the reaction product. No. 1,925,321. Wm. J. Hale & E. C. Britton to The Dow Chem. Co.

Diphenyl from contacting benzene vapors at about 650-950° C. with tubular carbonaceous electrical conductor. No. 1,925,784. Wm. H. Williams to Dow Chemical Co.

Phosphoric and oxalic acids used for hardening of phenol-aldehyde condensation products. No. 1,927,375. Fritz Schmidt, Troisdorf, Germany.

Plastic of high sulfur content, from ethylene and sulfurized phenol plastic. No. 1,927,929. C. Ellis to Ellis-Foster Co., Montclair, N. J.

Pyroxylin

Method for reducing the length of time for curing pyroxylin plastic materials. No. 1,928,260. G. H. Murray to Nixon Nitration Works, Nixon, N. J.

Resins

Process of heating a carbohydrate-phenol resin until it becomes resistant to ammonia, later reactions becoming the same with hexamethylenetetramine. No. 1,923,321. J. V. Meigs, to Plastic Corp., of Del.

Resin acid-polyhydric alcohol esters from dry-distilling a natural resin at 260° C. and heating. No. 1,923,507. I. Rosenblum, Jackson Hts., N. Y.

Finely ground wood, phenol and a mineral acid, convertible by heat and pressure to a molding composition. No. 1,923,756. E. C. Sherrard & E. Beglinger, Wisconsin, to free use of Government and people of U. S.

Glycerol phthalic anhydride resin with neutral phenyl benzene-sulfonate. No. 1,924,396. T. S. Carswell to Monsanto Chemical Co.

Method of producing esters of resin acids. No. 1,924,934. Alan C. Johnston to Hercules Powder Co., Del.

Polyhydric alcohol-polybasic acid resin made by fermenting a glyceride and esterifying the result with an organic polybasic acid. No. 1,925,935. Paul Robinson, Pa., to E. I. duPont de Nemours & Co.

Manufacture of resins from polyhydric alcohols and polybasic acids. No. 1,925,947. W. Baird & E. V. Walker to Imp. Chem. Industries, Westminster, England.

Process for making styrols. No. 1,926,314. O. H. Smith to Naugatuck Chemical Co.

Sulfur-containing resin on methylene sulfide as a plastic. No. 1,927,930. C. Ellis to Ellis-Foster Co., Montclair, N. J.

Cellulose

Process of producing a mixed ester of cellulose. No. 1,928,652. C. J. Malm and C. R. Fordyce to Eastman Kodak Co.

Mold with sprayed metal coating for cellulose plastic forms. No. 1,928,712. J. F. Walsh and B. Andersen, to Celluloid Corp., N. J.

Process for receiving acetic acid from wood distillation. No. 1,928,746. W. S. Wilson, to Merrimac Chemical Co., Boston, Mass.

Impregnating fiberboard with alcohol solution of an ammonium-forming salt and process for forming said salt throughout the board. No. k,928,805. A. Winogradow, N. Y.

Manufacture of paper pulp from colored rags by hot caustic alkali, water and hydrosulfite alkaline solutions. No. 1,929,145. S. Lenher and H. F. Lewis, to E. I. duPont & Co.

Composition containing cellulose derivative and a diphenylol naphthalene as plastifier. No. 1,929,210. W. H. Moss, to Celanese Corp.

Acetyl-cellulose plastic—dissolved cellulose ester forming a filterable solution to remove impurities, forming in partly dry films before evaporating solvent, and heat-rolling remainder of solvent before solidifying material under heat and pressure. No. 1,929,225. J. F. Walsh and Amerigo F. Caprio, to Celluloid Corp., Newark.

Reducing halation in film by roughening its material at the rear face and applying an absorbing substance to this part. No. 1,929,254. A. Narath, Berlin, to General Electric Co.

Mercerizing cellulose and soaking fibrous material with a solution of barium compound in the process of making a better paste extender for lead-acid cell electrodes. No. k,929,357. James O. Johnstone, Hammond, Ind. to Chemical & Pigment Co.

Imprinting regenerated cellulose by drying and subjecting the articles to high temperature in a humid atmosphere. No. 1,929,394. J. Voess, Germany, to The Visking Corp., Chicago.

Cellulose derivatives retaining original structure of fiber, with strong affinity for acid dyes. No. 1,929,868. R. Haller and A. Heckendorf, Basel, to Society of Chemical Industry.

Incorporating 4-20% of the plasticizer, as synthetic resin, in the production of plastic material from cellulose derivatives. No. 1,930,069. James F. Walsh and Amerigo F. Caprio to Celuloid Corp., Newark.

Decolorizing a dyed cellulose acid sheet material. No. 1,930,133. M. J. Reid, to Eastman Kodak Co.

Cellulose organic ester composition containing propylene chloride. No. 1,930,134. H. B. Smith to Eastman Kodak Co., Rochester, N. Y.

Cellulose organic ester a lower alkyl ester of a substituted benzoic acid. No. 1,930,135. H. B. Smith & S. J. Carroll, to Eastman Kodak Co., Rochester, N. Y.

Cellulose organic ester a cyclic acetate. No. 1,930,136. H. B. Smith to Eastman Kodak Co., Rochester, N. Y.

Cellulose ester composition. No. 1,930,142. J. G. Capstaff, to Eastman Kodak Co., Rochester.

Concentrated organic acid pre-treatment of cellulose, for making acetone-soluble cellulose acetate with aldehyde. No. 1,930,145. T. F. Murray, Jr. and H. LeB. Gray to Eastman Kodak Co., Rochester, N. Y.

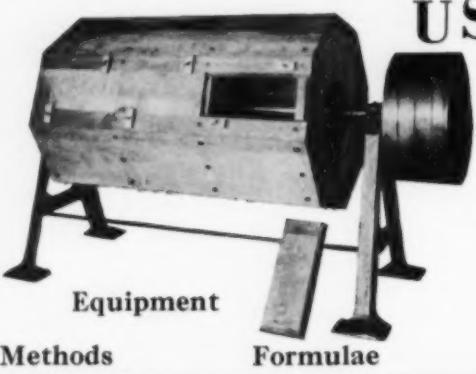
Derivatives from cellulose whose base reacts with an etherifying agent to produce a halogen containing ether. No. 1,930,471. Henry Dreyfus, London.

Process for the manufacture of cellulose derivatives. No. 1,930,472. Henry Dreyfus, London.

Modified aliphatic acid anhydride for esterifying cellulose while maintaining its structure. No. 1,930,895. R. Haller and A. Ruperti, to Society of Chemical Industry, Basel.

Pyroxylin tubing from thin, flat, transparent sheets carrying designs and wrapped in turns about a common axis; these overlapped laminations showing an under design, with the end portion cemented and the roll subjected to heat and pressure, welding transparent decorated laminations through the entire roll. No. 1,930,995. C. J. Carroll, to Nixon Nitration Works, N. J.

Fibrous sound-record, sized, with two disks of cellulose ester solution on one side that are themally adhesive, other side given



USE—BARREL FINISHING

for the most perfect, economical
polishing of—

VEGETABLE IVORY • HARD RUBBER •
PYROXYLIN • PHENOLIC PLASTICS • CATALIN •
CASEIN • HORN

Applies a lasting finish; eliminates buffing. Write or particulars.

RUDOLPH R. SIEBERT

183 St. Paul Street

Rochester, N. Y.

"MATCH KING" LIGHTERS
Put New Life in a Dead Market!!!

Re-designed and molded of Plastic Materials, they have established new high records for lighter sales. Their smart design, colorful appearance and light weight quickly found them a place in men's pockets and ladies' hand-bags. Plastic Molded Parts give to a product "eye-appeal"—the magic touch that insures larger sales and better profits. Perhaps your product can be made more salable by the use of Plastic Molded Parts. Tell us your problem.

Address, Merchandising Design Dep't.
CHICAGO MOLDED PRODUCTS CORP.
2146 Walnut St. Chicago, Ill.

GUSTAVUS J. ESSELEN, INC.

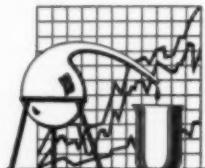
CHEMICAL RESEARCH
and DEVELOPMENT

*An organization experienced in
the solution of problems of*

**RESEARCH
DEVELOPMENT
PRODUCTION
EVALUATION**

—for the Plastics Industry

*Cellulose Plastics ::
:: Synthetic Resins*



73 NEWBURY ST., BOSTON

Newark Die Company

INCORPORATED

We Specialize on MOLDS for Plastic Materials

Die sinking, Engraving, Hydraulic Hobbing

24 SCOTT STREET
Newark, New Jersey

special treatment and body subjected to thermal pressure. No. 1,931,287. Laurence Fisher, New York.

Coatings

Drying composition for oxidizable oils, paints, varnishes and, resin derivatives, using as a seccative a certain metal salt of a toluic acid. No. 1,927,867. H. A. Bruson, Philadelphia.

Paint, varnish, lacquer or enamel rubbing compound, of soap in suspension, abrasive and pine oil. No. 1,927,872. P. H. Kramer, to Park Chem. Co., Detroit.

Paint, varnish, lacquer or enamel rubbing compound, of soap, in suspension, abrasive and pine oil. No. 1,927,872. P. H. Kramer, to Park Chemical Co., Detroit.

Method for acoustic diaphragms by dispersion of non-fibrous, waterproof thermoplastic material and fiber stock, then deposited on screen. No. 1,927,902. R. P. Rose, to Mechanical Rubber Co., Cleveland.

Process of impregnating for waterproofing, by vaporous applications—including hydrocarbons, phenols, tars and volatile chlorinated organic products. No. 1,928,105. Ludwig Kern, Webster Groves, Mo.

Coating for metallic surfaces by applying a cellulose film and a synthetic resin, then applying a film of resin-free coating composition from an organic derivative of cellulose. No. 1,929,559. W. H. Moss, to Celanese Corp., N. Y.

Apparatus for applying coatings to surfaces, particularly flexible strip material. No. 1,929,877. C. Bonamico, France, to Harold Wade, London.

Process and production of titanium dioxide from titanium tetrachloride. No. 1,931,380-381. H. Haber and P. Kubelka, to Krebs Pigment & Color Co., Newark.

Laminated

Laminated glass, of plurality of sheets and an adhered layer composed of a polymerization product of an ester of vinyl alcohol. J. G. Davidson, to Carbide & Carbon Chemicals Corp., N. Y.

Machinery

Plywood pressing apparatus with laterally moving conveyors. No. 1,929,897. L. G. Merritt and E. H. Merritt, to Laminating Patents Corp., Seattle, Wash.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912 Of Plastic Products, published monthly at Pittsfield, Mass., October first, 1933. State of New York, County of New York, ——.

Before me, a Notary Public in and for the State and county aforesaid, personally appeared Williams Haynes, who, having been duly sworn according to law, deposes and says that he is the Publisher of the Plastic Products, Inc., and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 411, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, Williams Haynes, 25 Spruce St., New York City; Business Manager, R. C. Gilmore, Jr., 25 Spruce St., New York City.

2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent. or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given.) Plastic Publications, Inc., 25 Spruce St., New York City.

3. That the known bondholders, mortgagees, and other security holders owning or holding one per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state) Mal Frost, 1 Wall St., New York City; Williams Haynes, 25 Spruce St., New York City; A. K. Gilmore, Montclair, New Jersey; George Hasslacher, % Mal Frost, 1 Wall St., New York City; Plastic Products, Inc., New York City; Carl Marx, 77 W. Wash. St., Chicago, Ill.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

5. That the average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the six months preceding the date shown above is (This information is required from daily publications only.)

Williams Haynes, Publisher.

Sworn to and subscribed before me this 28th day of September, 1933. Thomas A. Cruger, Notary Public, N. Y. Co. Clerk's No. 55 N. Y. Reg. No. 3,024. (Comm. Expires March 31, 1935.)

Natural or Dyed Cotton Flocks of Superior Quality

We are suppliers to all the leaders in the Plastic Moulding Industry.

THEY KNOW QUALITY!

Write for samples and quotations

Claremont Waste Mfg. Co.

CLAREMONT, N. H.

GOOD USED MACHINERY

Every item shipped from our shops at Newark, N. J., is thoroughly overhauled and rebuilt

PREFORM MACHINES—1—Colton No. 5 Tablet Machine, 2"; 1—Colton No. 4½ Tablet Machine, 1¾"; 1—Stokes "H" Tablet Machine 2"; 1—Stokes "T" belt driven, up to 1¾"; 1—Fraser belt driven machine, 2" tablet; 1—Colton No. 3 Rotary 16 punch, up to 1".

Several Smaller Machines, Power and Hand.

MIXERS—4—W. & P. Steam Jacketed Mixers, 100 and 150 gals.; 1—Day Mogul 5 Gal. Jacketed Mixer; 1—No. 3 Banbury Mixer; 4—Triumph dbl. arm 200 gal. motor driven.

STILLS—4—Copper, Steam Jacketed Stills, 500, 150, 50 gals.

PULVERIZERS—All types of Hammer Mills; Raymond and other makes of fine Pulverizers; Crushers, all sizes and types. Send for Bulletin No. 14.

ACCUMULATORS—Various sizes; **SPECIAL**: 1—Watson-Stillman Hydro Pneumatic Accumulator, complete with motor driven air pump and motor driven Watson-Stillman Hydraulic Pump, four cylinder, 1½" x 2".

MISCELLANEOUS—Hydraulic Presses, Vibrating Screens, Mixing and Converting Rolls, Color Grinding and Mixing Equipment, Vacuum Shelf Dryers, Filter Presses, Impregnators, Kettles, Masticators, Pumps, Tanks, etc.

We Pay Cash For Your Idle Machinery--Single Items or Complete Plants

CONSOLIDATED PRODUCTS CO., INC., 13-14 Park Row, N. Y. C.

Visit our shops and yards at 335 Doremus Avenue, Newark, N. J., covering six acres.

BARCLAY 7-0600

LOOK

Look around and see the opportunities to make use of the beauty, durability, and economy of nitrocellulose sheets, plastics, and finishing materials. No doubt you, too, can cash in on the unique advantages of nitrocellulose in your products and processes.



HERCULES NITROCELLULOSE
HERCULES POWDER COMPANY
INCORPORATED
Wilmington, Delaware

AAA-18

ADVANCE•ADVANCE•AD

UREA

UREA - A
HIGHEST PURITY

UREA - T
TECHNICALLY PURE

ADVANCE SOLVENTS &
CHEMICAL CORPORATION

245 Fifth Avenue, New York, N. Y.

Dept. S

Ashland 4-7055

VANCE•ADVANCE•ADVANCE•

Complete Service:

Beginning with the designing of the moulds to the finishing of moulded products--including the moulding in of metal inserts--as per your specifications.

Let us quote on your requirements

Plastic Moulding of Beetle and Bakelite of the better kind

Kuhn & Jacob Moulding & Tool Co.

503 Prospect St. Trenton, N. J.

N. Y. Office: Phone Defender 3-6442
Phila. Office: Phone Sagamore 5173
Detroit Office: Phone Trinity 2-0122

The Plastic Molding Company

Sandy Hook, Conn.

Completely equipped for hot or cold
CUSTOM MOLDING

FOR SALE

150 TON BUSCH-SULZER DUO PRESS

Used less than three months. Offered at very attractive price. Inspect at our address.

♦ ♦ ♦
LOUIS E. EMERMAN & CO.
1761 Elston Ave. Chicago

ADVERTISER'S INDEX

Page	Page
Advance Solvents Corp.....	382
American-British Chemical Supplies, Inc.....	372
American Catalin Corp.....	347
American Plastics Corp.....	370
American Record Corp.....	384
Auburn Button Works, Inc.....	383
Bakelite Corporation.....	353
Bay State Moulding Co., Inc.....	384
Becker-Moore Co.....	376
Boonton Molding Co.....	383
Brooklyn Color Works, Inc.....	384
Burnet Co., The.....	383
Burr Chromium Co.....	384
Calco Chemical Co., The, Inc., insert facing page	367
Cavagnaro, John J.....	374
Chicago Molded Products Corp.....	380
Claremont Waste Mfg. Co.....	381
Compo-Site, Inc.....	384
Consolidated Products Corp.....	381
Eagle Tool & Machine Co.....	384
Emerman Louis E. & Co.....	382
Esselen, Gustavus J., Inc.....	380
Exposition of Chemical Industries.....	368
French Oil Mill Machinery Co.....	378
General Dyestuff Corp.....	Cover 4
General Electric Co.....	350-351
General Plastics, Inc.....	354
Gering, Larry, Inc.....	383
Hercules Powder Co.....	382
Heyden Chemical Co.....	378
Imperial Molded Products Corp.....	384
Kuhn & Jacob Molding & Tool Co.....	382
Makalot Corp.....	Cover 3
Marblette Corp.....	349
Monsanto Chemical Works.....	385
National Aniline & Chemical Co., Inc.....	368
Newark Die Co.....	380
Plastics Guide-Book.....	Cover 2
Plastic Molding Co.....	382
Recto Mfg. Co.....	376
Resinox Corp.....	374
Siebert, R. R.....	380
Shaw Insulator Co.....	Insert facing page
Sherka Chemical Co., Inc.....	370
Standard Tool Co.....	383
State Chemical Co. Inc.....	384
Stokes, F. J. Machine Co.....	372
Synthetic Plastics, Inc.....	352
Thropp, Wm. R. & Sons, Co.....	376
Waterbury Button Co., The.....	385

Classified Advertising

Rates for classified advertising, per issue, are \$1.00 for 20 words or less; 5c for each additional word. 10c for forwarding mail if box number is used. Payment must be enclosed with order, which must be received by publishers no later than the 20th of preceeding month.

SALES EXPERT: 5 years' experience with A-1 concern. Married. Only company contract with good firm considered. Established territory. Salary and expenses only arrangement. Will travel. Box 616, PLASTICS PRODUCTS.

FOR SALE: 1 Southwark High-Low Pumping Unit in excellent operating condition, low capacity of 215 pounds with from 50 to 75 gallons per minute, and a maximum capacity of 2,500 lbs. sufficient to operate 8 presses. 1—Zeh & Hahnemann Percussion Power Press with several dies for various size tablets. Both these items can be inspected in operation. Reply to Box 616, PLASTIC PRODUCTS.

AVAILABLE—A chemist with a good knowledge of the manufacture of molded products seeks a connection with a small well equipped organization specializing in molded products only. Well experienced. Reasonable. Reply to Box 615, PLASTIC PRODUCTS.

FOR IMMEDIATE SALE

(1) 1 set 16" x 36" mixing rolls with 150 HP. G. E. motor and compensator and link belt drive. (2) 9 hydraulic presses, Watson Stillman type platens 13" x 18", 2½" ram, 3½" stroke. (3) 5 William Thropp hydraulic presses, platen 15" x 15", 8" ram, 5" stroke. (4) 34 Standard type toggle presses, platens 13½" x 14½". (5) 18 steam tables 24" x 42", 15 steam tables 18" x 30". (6) 1-50 ton Terkelson press; 2-100 ton Terkelson press (Satest type). (7) 1 Meade Grinder. (8) 1 Jeffrey Grinder. (9) 1 Southwark High pressure Vertical Triplex Pump with 5 H. P. integral motor drive.

THE WATERBURY BUTTON COMPANY
Waterbury, Connecticut.



And Now, in Closing:—

A short while ago, a new box of Chiclets was being extensively advertised in subways as "wrapped in the astonishing new material Sylphwrap"—plenty astonishing to call Sylphwrap "new," and a likely reaction on the part of the dear public may well be "Oh, just a new kind of Cellophane!"

But perhaps we have been led to expect less and less candor in advertising. Which leads us to mention that the usual conservatism of British industrial publicity has recently been delicately broken by Hadfields, who are advertising their cellulose leather dopes in English Trade papers under the catching library caption "Dr. Lacquer and Mr. Hide"—constituting a departure from advertising custom that is all too infrequent in any country.

As an indication of the progressiveness of chain-store suppliers, note that Bakelite has had a display of chemical ingredients in Woolworth's windows, accompanied by stacks of heater plugs, outlets, etc. While watching the one at the 40th Street, Fifth Avenue, store, we noticed that the ratio of window shoppers who took an interest was about three men to each woman. This would have been changed, perhaps, by featuring asbestos more prominently and dramatically, showing the safety of the composition.

By confining herself to cellulose products, a woman could be attractively dressed—all her clothes, shoes, belt, handbag, hairpins and every necessary item. Now, however, she can decorate her nails in harmony with her clothes by choosing any of many artificial pyroxylin nails which glue easily on top of her own. There is a rumor afoot that the inventors of this new nail actually caused the depression in order to advance nail-biting. Our investigation of this rumor—which, by the way, is false—accounted for our disposition of a full box of "Nail set No. 6; MEN."

E. C. Atwell whose paper "Cellulose Nitrate vs. Cellulose Acetate" is presented in this issue, backs up his summary with experience on plastics—coatings and adhesives especially—that has connected him with Arthur D. Little since 1924. He is a graduate of M. I. T., served in the U. S. Navy during the World War and at present is Lieutenant (jg) in the U. S. Naval Reserve. His hobbies are high frequency radio, photography, and plastics.



How many of us know that the Transparent Man, exhibited at the Century of Progress, is built almost entirely of plastics? He—or it, if you prefer!—was built during the past several years by a German firm, and cost many thousands of dollars. Perfectly constructed, the plastic body shows all bones, blood vessels, etc. and the coloring system used enables one to follow the respiratory and digestive functions. There is only one other Transparent Man in the world. Both are insured against breakage—even though made of a "non-breakable" plastic!

The indefinite postponing of the closing of the Fair, together with a rumor that it may remain open all next year, certainly puts it in a fair way to being either a Century of Exposing Progress just A Century—in Progress.

Noticing the winged acorn on the Arthur D. Little letterhead makes us wonder why this proverb idea isn't carried along further. An arrow with a question mark; a stone without moss; a picture of us all lying in the beds we made.

Taken seriously ill, he was forced to have his teeth removed. But he balked at the last, lone molar, refusing to part with it. The dentist, naturally, asked why—"I may be an Elk someday," said (you guessed it) Bert Lahr!

We picked up a story in our rounds that may be too ancient to provoke laughter. It should certainly be recorded, however, and we hope our version of it will effectively preserve it.

A vacationing business man, completely semetic, had gone swimming over his depth and was seized with panic. His cries for help brought a rescuer in the form of a Scotchman who successfully towed the Jew within fifty yards from shore. "Can you float alone now?" queried Sandy, "Oi, Oi" came the shrieking response, "business at such a time."

On the table in the lounge in the Chemists' Club, N. Y. lies a little used Bible. Referring to the Book of Revelations, the thirteenth Chapter, the 16th and 17th verses have been heavily scored—they read as follows: "And He called all, both small and great, rich and poor, free and bound, to receive a mark in the right hand and on their forehead. And no man might buy or sell save that he had the mark or name of the beast or number of his name."

It is utterly inappropriate that we should praise a new book which has just been published by D. Van Nostrand & Co., 250 Park Ave., New York (Price, \$3.00: advt.) but we cannot see why we should not quote what a du Pont Director and President of the American Chemical Society says about it:

"Chemical Economics by William Haynes, the publisher of CHEMICAL INDUSTRIES, covers the field in a way which makes it of great interest and value to everyone interested in the chemical industry, particularly to young students of chemistry and to men connected with the industry."—Charles L. Reese.

In combining our orchid-wilted dandelion award this month, we honor the unknown soldier of misfortune who spoke of managed currency as the kind you "manage to hold on to" and whose favorite saying starts—"A stitch inflation saves—."

Of course, the first step in recognizing Russia is to make them take off those whiskers!

BOOTH 28
Main floor — Chemical
"Show" week of December
4—an exhibit of New De-
velopments in the Industry,
explained and displayed by
PLASTIC PRODUCTS
and
CHEMICAL INDUSTRIES

Plastic Products

Nov. '33: IX, 9